

AVIATION

The Oldest American Aeronautical Magazine

68 TWIN WASPS

For United Air Lines New Fleet

New laurels for United Air Lines! Again they set the pace in commercial air transportation with their giant Douglas Mainliners... each ship powered by two TWIN WASPS. Over 1200 Pratt & Whitney twin row engines have already demonstrated their dependability in military and naval operation. Now they are bringing smoother performance and faster schedules to air travelers on America's famous Mainline.



PRATT & WHITNEY AIRCRAFT
EAST HARTFORD CONNECTICUT

Divisions of
UNITED AIRCRAFT CORPORATION

For that
**Added Margin
of Safety...**



**SHELBY
Seamless
AIRCRAFT TUBING**

THERE can be no compromise with safety in aircraft construction—an absolute for pre-determined reliability. For all the skill of designer and builder may go for saving in their materials but their rigidly, fine balance, that added margin of safety, depend absolutely on the perfection of the tubular design.

Seamless Aircraft Tubing is the natural solution to this really important problem of framework construction. The light weight, high tensile strength, uniformity and durability of this superior steel tubing offer both designer and builder a service-tested material that con-

veys maximum safety with lightness and superior strength. Its perfection is constantly safeguarded to maintain reliability. Every foot of Shelby Seamless must pass through an intensive system of testing and inspection. Both physical and chemical properties are made to conform to the United States Army and Navy specifications.

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NATIONAL TUBE COMPANY

PITTSBURGH, PA.



Circle 100 on Reader Service Card

Circle 101 on Reader Service Card

UNITED STATES STEEL



The Great Silver Fleet
NOW EVEN GREATER
with 21 Passenger Douglas Airliners
Powered by **WRIGHT CYCLONES**

Going South this Winter? Fly on "The Great Silver Fleet" now even GREATER by the addition of giant, new 21 passenger Douglas airliners, powered exclusively by Wright Cyclones. Eastern Air Lines' super-aircrafts provide the swiftest, most luxurious transportation to Florida and the Southland.

New E.A.L. schedules include fast swift round trips daily between New York and Miami, and two round trips daily between Chicago and Miami, with extra sections, when required.

Eastern Air Lines' new "Pan American Express" speeds daily between New York and Miami in 7 hours and 40 minutes—with only one refueling stop at Charleston. These express flights connect with Pan American Airways' schedules to and from the West Indies and South America.

The powerful Wright Cyclone engines that will speed your trip to the Southland have had operating experience totaling 145,000,000 engine flight miles on airlines throughout the world. Aircraft engines of such proven dependability power "The Great Silver Fleet."

"Fly With Wright the World Over"

WRIGHT

AERONAUTICAL CORPORATION
PATTERSON NEW JERSEY

A DIVISION OF CHRYSLER FINANCIAL CORPORATION

EASTERN AIR LINES

NEW YORK WASHINGTON MIAMI

NEW YORK NEW ORLEANS WASHINGTON

CHICAGO ATLANTA MIAMI

•

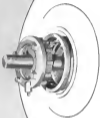
NEW YORK WASHINGTON

14 Round Trips Daily



LIGHTNESS *Leads*

TO GREATER
PAYLOAD
CAPACITY!



The wheel and axle concept of the Dowmetal Dowmetal air engine is Dowmetal. Here, when Dowmetal meets the demand for extreme lightness, it gives Dowmetal an excellent design in weight, strength, and cost. Dowmetal is the most common material used in aircraft.

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ALL OTHER PRACTICAL METALS!

The full weight of Dowmetal's extreme lightness is significant all along the line of American industry. Offering, as it does, a lightweight advantage of 5 to 10 times over aluminum, yet giving comparable strength and durability, Dowmetal is literally saving every ounce.

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But, it's not just the value of Dowmetal in the construction of larger payloads for the post-war world; it has demonstrated its great value in the field of aircraft. Today it is showing leaders and users of aircraft and how it can cut dead weight and greatly increase payload capacity.

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Remember yourself with Dowmetal—on a basic model—in the world's lightest aircraft model. Learn how it is going into low-cost, new products.

decision. Especially, how it can come to the aid and assistance of the product you produce or equipment you use.

Write today for "The Dowmetal Data Book" and you'll get the complete story, technically.

DOWMETAL

BARRETT AL-694
DIVISION OF ALL STATEWAYS METALS

THE DOW CHEMICAL COMPANY—Dowmetal Division—Midland, Michigan



Hundred Horsepower Hands!

- Only one pair of hands, but placed on the handle of a YALE Hand Lift Truck—they match the power of a hundred horses!

You can't wrong profits from today's highly competitive markets with horsepower methods. It takes high-speed efficiency at low cost to count on the back of your ledger—... the hand of efficiency that a YALE Hand Lift Truck and Good Platform System throughout your plant will give.

Speedy Saving Sale... YALE Trucks carry the burdens of American industry. They are almost any successful plant, and you'll find them economically going about their business of lifting—hauling—storing—powerful profits makers—that's what they are!

Made in all sizes—Single and Multi-Stroke models—types and capacities of 1,000 to 20,000 lbs.—there's a YALE Truck to fit your every need. Designed and built by YALE engineers to give lasting economical service, you'll find them the answer to your material handling problems.

Let a YALE representative show you how you, too, can give your workmen Hundred Horsepower Hands.

"WE'LL BE GLAD TO SEND YOU NAMES OF INDUSTRIAL LEADERS WHO... WHO ARE SAVING TIME AND MONEY THE YALE TRUCK WAY."



ALWAYS—This equipment stays in perfect condition. The YALE Truck is designed to be used over and over again in every plant. The YALE Truck is designed to be used over and over again in every plant.

**SPEED
ECONOMY**

YALE

**SAFETY
EFFICIENCY**

IN MATERIALS HANDLING

THE YALE & TOWNE MANUFACTURING COMPANY, PHILADELPHIA DIVISION, PHILADELPHIA, PA.

No. 2 of a series of plates
showing activity in the
modern aluminum research
on various D.C. and B.C.
Processes, Powerhouse

*LOOK BEYOND
HIM!*

A lifetime spent by this die-maker winning his skill... years of painstaking
research in developing an alloy with the best characteristics for the forging which
the die will make... production facilities built with the one ideal of using an
actual profile the best "science" contributed by engineering and research...
each in the background of this picture. Men, materials, and machines are de-
voted unswervingly to making Alcoa Aluminum better for the jobs in which its
lightness, strength, heat conductivity, and resistance to corrosion are needed.
As the work progresses, it makes possible better planes, better performance.
(Plans of die-maker finishing American forging die in Alcoa plant. Courtesy of Alcoa Corp.)

ALCOA  ALUMINUM



DEFENSE... *in step with
the progress of a Nation!*



Built by Boeing for the United States Army Air Corps, this giant four-engined
bomber and her 32 sister ships are bringing to the world a new concept in aerial
defense. Too, these stalwarts portend the brilliant future of commercial air trans-
portation as have other Boeing Bombers of the past. ✪ Thus through its far-sighted
policy, the United States Army not only provides continued assurance of national
security, but once again quickly performs one of its characteristic services to civil
progress by introducing the trend of tomorrow's air transports.

Boeing has always built tomorrow's airplanes today!




CHANCE VUGHT AIRCRAFT
San Francisco, California
Division of
UNITED AIRCRAFT CORPORATION

Eighty-four of these SBU-1 Scout Bombers have gone into service with the U. S. Fleet during the past few months. Outstanding in performance and tactical effectiveness, they are already adding new lustre to this famous name—

Vought Corsair

* An additional production order for airplanes of the same basic type has just been placed by the U. S. Navy

THE
OLDEST AMERICAN
ARCHAEOLOGICAL MAGAZINE

AVIATION

BONNIE 443
McGraw-Hill Publishing Company, Inc.

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For Mollison's "Flash"

**THIS AND OTHER BELLANCAS
ARE RIGGED WITH...**



**ROEBLING
AIRCRAFT CORD**

Roebbling Wire Aircraft Products include—
Tinned Aircraft Wire, 19-gauge Aircraft
Strand, Tinned or Galvanized Aircraft Cord
(No. 7, 7.5, 7.25), Tinned and Galvanized
Female and Thinking) Soring and
Locking Wire; Control Strand and Cable;
Power and Lighting Cable; Folding Wire.

WITH controls operated by Roebbling Aircraft Cord, Capt. James Mollison, in his Bellanca Flash, flies to a new record across the Atlantic.

Here, as on their other ships, Bellencas has standardized on Roebbling... not only Aircraft Cord but Electrical Wire and Cable as well.

You will also find Roebbling Aircraft Products widely used by most of the other principal plane builders.

Roebbling Wire Aircraft Products include—
Tinned Aircraft Wire, 19-gauge Aircraft
Strand, Tinned or Galvanized Aircraft Cord
(No. 7, 7.5, 7.25), Tinned and Galvanized
Female and Thinking) Soring and
Locking Wire; Control Strand and Cable;
Power and Lighting Cable; Folding Wire.

JOHN A. ROEBBLING'S SONS COMPANY
TRENTON, N. J. *Producers in Principal Cords*



**From the Skyways
of the World**

► UNITED AIR LINES has just placed an order for some 150,000 gallons of gasoline with Standard of Indiana, delivery beginning in 1937. Some of the boys got out their slide rule, but a little less. They figured that 15 million gallons would take the average automobile 6,250 times around the earth at the rate, would fuel it for 511 trips to the moon (if anybody wanted to go there). Through the average kitchen faucet running full out, it would take ten years to pour it all down the sink (provided no one happened to light the range).

► A W. GRIFFITH is the latest. A wire, a phone call or so as usual letter to Air Shipping (204 East 42nd Street, New York) will get you anything from beach clothes, baggage and brandy to Texas pecans and baby carter. Rates are single cash on the barrel-head—and the shipper is rushed to pay by air express. Good idea, say we.

► HAD A PHONE CALL from NAA's DE Export from Washington the other day to tell us that he was on the point of making for France to attend the annual meeting of the FAI at Paris. He is planning to take a short cruise into England, Germany and Italy before returning. With our own aviation experiences still fresh in mind, we are certain the Bill is looking his visit well worth while.

► AND SPEAKING OF RETURNED TRAVELERS, we see that Al Williams has been making a daily feature on his European observations in the Scripps-Bowdoin column, including New York's *World-Telegram*.

► AL MADE THE PAPER, too, on New Year's Day when for the second time (he did the same thing last year), he was the first man on the North American continent to greet the dawn of the new year. Taking off from Floyd Bennett Airport

before sunrise in his brand new single seater, Gullhawk II (built for him by Grossman and powered with a super-dog Wright G Cyclone—one also page 44), he pulled up to over 22,000-odd feet and watched the sun break over the eastern horizon long before it was visible to groundlings making whoopee in Manhattan Bay below.

► IN GETTING THROUGH with material for a talk on the electrical problems involved in this aviation business (for the Transportation Division of the AIEE) we ran across an interesting incident. It takes some 1,200 ft. of wire to connect up the electrical controls of a Martin Bomber, some 5,500 ft. for a Douglas DC-3. Quite a contrast to the "unimproved" wiring of the good old JN-4 over which we used to sit up nights in Air Service Kitchens during the war. Reckon of 1915.

► FAVORITE TRICK of rehearsal business in the progressive dinner—cocktails at the Souths, soup at the Dockers, entree at the Ediths, and so on (as far into the night). Some soup was used recently at Philadelphia, except that the guests progressed by air. Miss Inland cocktails at Pates, fruit soup at Wiages, soup at Pateson's history (with trout soup) at Central, salad at Storch East, pie and ice cream at Canter-

AVIATION'S AUTHORS

We have with us this month... David Duggan who is well known as a frequent contributor and former member of *American*'s staff. Don has made a study of the recent changes in British air transport policy and records these here.

Charles Duggan Wright has done up a list of material around the San Francisco area... W. C. MacArthur, of Col. Tuck, and Dr. Martin B. Mason, of Douglas continue their consideration of the ultimate performance of airplanes... Don Duggan is with us again... and Ed Warner gives us the continued matter of the first real story of bumps and bruises about the airplane atmosphere reported by Richard Blake of the NACA... Geoffrey Thib. Va.



Always - TO A FLYING START

Never intefed to "It will enough slow" and dedicated to the traditional Stinson Policy of constant improvement without haste, shortening changes, the 1957 Stinson "Reliant" began coming off the Production Line during the first week of January.

Champion of 1956, the "Reliant" is destined to lead again in 1957 because it embodies qualities that Owners and Users want us to supply.

Admitting that the "Reliant" had the best combination of desirable flying essentials ever built into an airplane of its type, loyal Stinson Owners, who comprise the largest group of civilian plane flyers in the Nation, agreed as to go forward . . . to get more speed . . . even slower landing ability . . . better visibility . . . a quieter cabin . . . better vision . . . additional comfort . . . improved accessibility.

Our Engineers have accomplished ALL of these improvements and added a few more for good measure. Months of designing, building, testing—then re-building and re-testing until our Test Pilots and "OK For Production" . . . Then weeks of retooling our Factory to produce this airplane in the largest quantity we have ever attempted and to the rigid Standards of Quality demanded by an Inspection Division which is a law unto itself because it has no boss.

Many of our Distributors already have that 1957 "Reliant" for you to inspect and fly—more will be supplied to them as rapidly as Quality Production permits.

If you did not receive your copy of the 1957 Stinson Plane News, please ask for it. It is free and tells all about this 1957 Stinson "Reliant."

STINSON AIRCRAFT CORPORATION

DIVISION AVIATION MANUFACTURING CORPORATION

WAYNE

MICHIGAN

U.S.A.

tion, and coffee at Boulevard Airport. Forty eight planes went this route with 180 people on board. Although a 20 mile wind made the going anything but smooth, no casualties—personnel or otherwise—were reported.

Once or twice more unidentified and search-white flares, we have seen for a long while in the demonstration called "Flight in Nature and Human Flight" put on at Philadelphia's Franklin Institute. Although legend to the level of understanding of the average layman, we can guarantee that even the most hardened aviator will find it through the movie. It seems well over a year. Beginning with a few very simple laboratory type experiments to illustrate the several possible forms of flight, the show moves along to a climax of model flights and motion pictures that are really remarkable. The pictures in particular should not be missed. They were taken with the ultra-high speed equipment at MIT (1,200 frames a second) and show the minute details of take off and landing of a number of land and marine birds. They even show down the wing surface of a Bluebird, fast enough to permit a study of the behavior of the feathers in forward and backward flight.

The demonstration is ably handled by Ralph McClure of the Institute Staff, and secretary of the Pennsylvania Aero Club. It attracted many people during the recent holiday days, and we understand that plans are afoot to take it on the road. We hope so, for the more people who can see it, the better.

Aviation's Eugene Barry and Iregal News Galtrey, Charlie Cleveland, is just in from a quick trip to the Public Loan where he found the aeronautical industry fairly making with good cheer and optimism for the prospects for 1957. Plans and people are better than ever before, order backlog, both commercial and military, have reached new highs. Charlie drove out, flew back via TWA. When he landed, he covered the 3,500 miles in nine days and, in spite of several mechanical failures, a brush with the law, and a blizzard over the Alleghenies, reports that he still likes to drive. On the way he landed at on Fred Perle at St. Louis, Claude



Aviation's Eugene Barry and Iregal News Galtrey, Charlie Cleveland, is just in from a quick trip to the Public Loan where he found the aeronautical industry fairly making with good cheer and optimism for the prospects for 1957.

Ryan and Earl Prudden, Ed Gert at San Diego. In L.A. he went through Douglas, North American, Northrop and Lockheed, visited General Good and United Terminal. Randomly he looked over TWA facilities at Kansas City and Chicago.

Not long since we spent a very interesting hour in the air with "Vee" Vee-Cave, right hand man to Dave Little (NCA), aircraft radio department. (Dave was down with the Grippe at the time, but we are glad to know that he is back on his feet. We say it fondly, for the entire staff of Aviation has put together through it, and we know it isn't much fun.) We had dropped in at the Camden place to get things up on the latest in RCA equipment, and, after going through the new demonstration room (which, incidentally, is a very well set up, well worth a look if you are near Philadelphia) we checked out the Ear

child 24 and crissed up and down the cover for a while going the way radio comes a sort-of. It was a pretty find day, in days on Chicago and visiting with adequate, but we barged through occasional rain and snow squalls that unfocused plenty of static. It made a good demonstration, however, for, in spite of the interference, we were able to get bearings on plenty of stations to keep ourselves located all the time.

RCA has assembled quite a fleet of aircraft for their radio research. In addition to the original Stinson B, which is still in service, they now have the Fairchild 24, a Waco C and a Ford to make parceled from TWA. The three appear all over the country, but Camden is their home port. Hal Sherris, operator of the Camden Flying Service, keeps close to shape.

Many a moving picture star stands through the "cinema" on wheels and people, into a double do it which it comes to the actual flying. Not so Wilbur Berry. A two-tailed sportsman, he is equally at home with rod and gun on home back and on wheels—and on wings in the air. He has been a transport pilot since 1928, has owned a number of planes, has flown in every to the end of the war years when the hunting and fishing are good. Latest addition to his aerial stable is one of the new 4-place Stinson Reliant. (page 35). Not long since he finished up in Wayne to take delivery of the new ship and in look over the Stinson factory.



CONSTANT supervision of every mechanical detail is the most important element in airline operation. Here a FAA mechanic gives final touch to the engine of a Cessna before departure for the long haul to EA.



CARNIVAL in MANHATTAN

First Airshow in Seven Years tops a
reviving Eastern Market



STRANGE THINGS BEGAN to happen around Manhattan about a week ago. Patrolman Pericle O'Sullivan, on traffic duty for 20 years at 46th Street and Lexington Avenue, told a weird tale at dinner one night:

"I remember it almost, but no, that devil's contraption of an airplane without wings that drives up the street like a taxicab. I was going to give it a ticket, but the driver was a good guy named Jim Ray and I let him go with a warning."

Several days later Patrolman O'Sullivan had another near-heart attack when Coney Jones blasted the sky with a formation of miscellaneous commercial airplanes. The same night all seven little O'Sullivans nearly fell out of bed when the Army and Navy began to drive on the city in a madman's air attack.

As you may have guessed by this time, the strange happenings that plagued the O'Sullivans were just the lesser children of Marquis Parsons and Publicity Director Moore at the National Aviation Show.

Within the Grand Central Palace during the period of Jan. 28-Feb. 6 will be a number of educa-

tional exhibits. A miniature version of the New York airport control tower with an opportunity for the public to listen in on operations; a demonstration of the one-pound billion-horse radio racingograph which investigates and reports on weather conditions at ten minute intervals at its 10-mile high flight; a guest map of the United States made periodically for pilots by the Coast and Geodetic Survey; models of some of the NACA laboratory equipment.

A Post Office Department exhibit of the history and present status of the air mail system; Army, Navy, and Coast Guard equipment; activities of the M. Y. National Guard; activities of women in aviation; model building by the Junior Engineers; and an old tractor's look by the Early Birds.

Included in the air transport exhibit will be the TWA "Overmaster Laboratory" with personal appearances of D. W. (Doc) Tamm.

Advance production of these exhibits are always dangerous, but the following constitute the best intentions of certain exhibitors at the time of writing:

(Turn to page 22)

Continued E.68
with two mortgages

Keywords: 2B; Cerebral
propeller



Revised: 0-798



Twice as often
London 1. Max speed



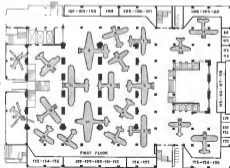
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Cypress: Wave 11



Consistent with

Warner Japan
Inc.

Executive Director

Paul V. Gilbert, Penn
University



Erinnere Dich!



Religious Devotion

Maximum stored. Space
 8.7

Aeromarine's Oldsmobile Horace Kross with a modern Ford engine! Aer very much at an improvement over the 1932 design of the same name... latest high and low wing designs by Aeromarine... the Aeromarine "Vista," a Mustang powered amphibian in the \$1,000 price class... the new Arrive sport Y-5 with a quartered Ford engine... a B17 B and Louise Thayer's Bonheur... a collection of trophies and plaques... the streamlined standard steel amphibian "Sea Bird" now in production by Herring, Inc... the low wing Maconoch and the high wing Monocoupe by Lambert Aircraft Corporation... Laflin 90 powered Brewster Sparrow (See Aviation, January, 1937) and the higher performance Spindler... a 125 hp Ryan S-7-A similar to the one in the Chatterfield advertisement... the large and fast Stearns Nelson for 1937 (see page 35)... airplane float equipment installed on a Taylor Silver Link... attractive models of the Vought Scout Bomber, and Figher, and the Sikorsky S-42 and S-43, by United Aircraft Corporation... a new Wain line for 1937 with a host of detailed improvements.

Examples: Model R-400-B, 300 hp

Licensing engine and two and three bladed controllable propellers by Aviation Manufacturing Corporation... two W-470 (radial) and two A-48 (opposed) Continental engines, including the new Scout S-A 40 with double ignition... a 1937 Jacobs L-5 200 hp engine with specific weight of 1.66 lb per horsepower... mounted canopy of four Pratt & Whitney engines (including a Twin Wasp) and automatic emergency control, two controllable pitch propellers and a category constant speed control mechanism... the latest Warner Super Scout (140 hp.)

Aeromarine's The new Albia Aircraft Spares of five subengines for aircraft and airport fire fighting equipment by American-La France and Faurens Industries, Inc... what the well dressed aviator should wear while on duty in the opinion of S. Lloyd & Co... a new exhaust gas analyzer, fuel and oil tests, including material, checking, and testing made by Herring Corporation, Inc... the Case Engineering Corporation's new aqueduct, self-cleaning oil filter for aircraft engines... standard float equipment and the new amphibian float gear (see page 37) developed by Lico

Aircraft Corporation... the Serrano Albiaster, and other Kalliania products including electric and magnetic tachometers, electrically heated Pratt static tubes and "Vibegon," a remote indicating device... Raymond-Ole Centre will show apparatus, constant speed, adjustable pitch, and variable type propellers having other blades of various section... Plymouth's new Pioneer (Flat Pipe for torpedos, a new 2-quart head extinguisher and other fire apparatus... a new eight pipe, battery igniter, switches, and magneto by Scientific... a replica of an Eastern Airlines airplane outfit with instruments and radio equipment for visitors to bring in actual orders, and a large scale model of an American Airlines "Flagship" furnished by Swaine's Shipping Co... a new rubber product, "Rubitec" made by Virginia Rubbers Corporation.

Scout and Services! Displays depicting the sales, instruction and aerial photography work at Duxbury-Robinson Inc... shows in young are waiting to get into aviation by Parks Air College, Inc... emphasis on a new Airline Operations course by the well known Stewart School.



MAINLINERS for HEADLINERS

LUXURIOUS New York Chicago non-stop service was started Jan. 19 by United Air Lines, using 14-passenger Douglas DC-4s, which United has named "Skyliners." They have normal capacity for 31 passengers, but United has installed only 14 completely smoking chair seats.

Fares on the Skyliner service are \$2.15 higher than standard fare, the New York-Chicago fare being \$80, instead of \$17.65.

At the start one round trip a day was run, but that was scheduled for expansion with delivery of additional ships. The 14-passenger version of which ten have been ordered, will eventually go into coast-to-coast service. By May 15 plans call for establishment of sleeper service connecting services originating in Skyliners and connecting with already-made-up 14-passenger sleepers in Chicago and Salt Lake. Night schedules will originate at airports. Eight sleepers have been ordered from Douglas, and following them will come five more 21-passenger versions of the DC-4, which will be used for local, heavy-traffic runs.



But food from the galley (above) is served on individual tables (top)



BRITAIN BIDS— for New Airways to Conquer



By Daniel Sayre

FOR SOME TEN YEARS the American air transport industry has looked upon the British counterpart as something else and considerably, probably as comfortable as the British aviation magnates say it is, but no more susceptible to revolutions of policy than the best design of Queen Mary's hull.

Recently, however, things have been stirring, but probably not quite as suddenly as it looks from over here. For years there has been talk

about "an Empire Air Mail Plan." For years, too, we have heard about what Great Britain would do in the Atlantic once she got around to it. And ever since the McRobertson case there have been rumors that Imperial Airways' plans weren't always going to lumber along on 115-mile an hour schedules. We even received definite word that a new equipment program had gotten underway sometime late in 1935.

Sometime, though, none of us ever

knew that all these things would ever come true at the end and the more tame. In all of its honorable history, Imperial Airways had never given any one cause to suspect it capable of breaking out in a perfect romp of progress. Yet that's just what it seems to be doing: 16-ton high-speed flying boats slipping off the assembly line like Taylor Cuts, four-engine super-speed land transports "about ready for tests" months before our corresponding DC-4 project

even promises to be off the drawing table and across toward a screen across the Atlantic. Now, when going as here, old ones to be torn up and new ones substituted to be slotted, Imperatives to double and redouble night flying to suit. Be-

hind it all, a design to make the world's first real run of an airbridge air transport of first class mail.

The more you sort it out, the more you realize that it all shapes up into a surprisingly unified and inevitable plan. The more you study the plan,

the more obvious becomes the plan to change the development of air transportation the world over. Call it long-overdue strategy, or a triumph of "maddening thorough" as you prefer, Imperial Airways' program for the immediate future, if carried out as announced, can already lead to give Great Britain a position in air transport equalling her leadership in ocean commerce. Herewith a summary of that program.

IT MUST first of all be appreciated that Imperial Airways is "the chosen instrument of His Majesty's government for the execution of Empire air routes." For a few years after Imperial was put together in 1924 from four competing trans-channel companies, it concentrated itself chiefly with passenger services between London and neighboring European airports. (It still, of course, operates such services through its subsidiary, Imperial Airways Continental Ltd.) But for a decade or more concern has been the aviation and operation of airfields being portions of the British Empire in the earlier country and with such old-fashioned milestones: Cairo-Bahra (1930), London-Cairo (1929), Rangoon-Karachi (1929), Cebu-Capitown (1932), Karachi-Singapore (1933), Singapore-Jakarta (1934), Peking-Hongkong (1936), Kanton-Kobe, Nagoya (1934). Total present routes stand at slightly over 27,000 miles.

For this Imperial Airways has received a moderate (about annual sub-





CUBS on the CAMPUS

By Charles Ogden Voight

JUE DONOVAN grew instantly out of his office window at the momentous beside flats of the Santa Clara Valley and reached for an aspirin. Here was the kind of flying country one would expect to find in Blanes, with a college full of young men at the very doorstep, and yet not enough business done the combination to keep even a single airplane busy for a day at a stretch.

There had been a method in its madness when Associated Air Services set up headquarters in a spot that was bounded on one side by the Stanford University Campus back to 1908. Surely some of the cases at the college would be interested in flying, and if they were not, a sales drive would be put on that would get them to fly. All this had been done in days past by her in this case as the books showed that the flying school had not been able to compete with new economy and students who now believed their budget.

He returned among his friends and students. He discussed the problem with nearby operators. He put up the question in front base operators through the world through the Operators' Council in America.

How a fixed base operator and a college flying club got together

MACHINE. SAIL DONOVAN found no one else answer listed his problem. Now the aspirin tablet Donovan had taken was not one of the quick acting variety which he needed so much in the advertisements. In fact it was very slow in getting started. It radiated a sort of dream, in which an adjectival found himself settling on his feet. He went turned back to those machine school days when he was like those boys in the nearby palace of learning. Suddenly it occurred to him that college men don't write home for sponsored checks each day in week. Even the most energetic sometimes run out of ideas for "journalistic expenditures." Like an aspirin rising from the blue waters on San Francisco bay, the answer appeared. Maybe the problem was the prospect's money. But how in the name of Heaven would he reduce the price. The profit margin was already desperately narrow.

WITH or without benefit of aspirin, the subjective thinking of a group of Stanford students was moving in the same direction. Finally they got their heads together with Donovan and things began to pay. They

remembered the example set by Amherst College in 1935 and that new light planes could be bought for very little down and not much a week. Before many hours had passed such of twenty club members had bought six hours of flying time at four dollars an hour. The down payment on a ship had been raised. But the club was not buying the plane. It was merely making a paying proposition to the airport operator. The club would pay the down payment and in return receive a guarantee from the operator of 120 hours time credited to the club.



This started the ball rolling. From then on it was easy. The air service agreed to furnish time at \$4 an hour on ships purchased in this way. New members flocked to the club house. Now the club has 32 own official plane and the list of five others approved by Associated Air Services. One of these is equipped with floats.

The airplane finally decided upon was the Taylor Cub. Some members wanted a larger and faster ship but these desiring economy won the day. For those who want time on latest equipment, two Fleet trainers owned by Associated Air Services are available at a slightly higher hourly rate. Three of the club members own their own ships.

Many of the twenty charter members did not know how to fly when the club was formed, but now all have at least noted although the only prerequisite for membership

was and still is an interest in aviation. An annual fee of one dollar is charged to cover incidental club expenses and pay for parts in the frequent competition. Monthly contributions are the basis of club activities. The club uses the championship cup at the Intercollegiate Flying Meet sponsored by the N.A.A. at Dayton last June. And it plans to hold more of it. Every week finds members hours dragging or not landing or doing the other things necessary to run an aircraft.

ONE SUNDAY in each month is devoted to a social scale as must. The first meeting the most guests for the series of meals held during the year gets a cup and is awarded Stanford's No. 1 prize. Spot landing and bomb dropping are the principal activities. For the latter paper bags filled with one pound of flour

are used with line make very accurate bombs.

Boys are no longer—

Two landings to be made by each contestant.

1. 1-200 degree turn and land in a ditch.

2. After first landing, contestant will furnish you with two bombs.

They shall be dropped at an altitude of one less than 500 ft.

The best of the two will count on score.

After bombs are dropped contestant will then make a straight approach to land.

The gun must be cut at 500 ft. or higher.

Choosing meter after passing from across disqualification.

Bad landing will mean disqualification. Skipping is permissible.

Massachusetts will be taken from where the toll child teacher to the bus.

The line is to be considered a ditch and any landing on the sandy side (front) of the line would be a theoretical mistake—disqualification.

Short side trips that lead over the San Francisco bay, in the Golden Gate, down along the coast to Del Mar and other moving resorts are the frequent destinations of many on afternoon jaunts.

In the person of Walter Stonefield, the Stanford Flying Club president, it is only a matter of time, especially at Stanford, when flying will become a regular extra-curricular activity, and events will be held with best schools such as California, Southern California, and U.C.L.A., to be topped by the N.A.A. intercollegiate meet in the spring of each year.



Left: Operators before the school plane is to be moved to the airport during bomb dropping exercise. Above: Club members and their Cub.

The Technique of Water Flying SEAPLANE HANDLING

By D. J. Brimm Jr.

THERE ARE FOUR main types of "boarding" points which the seaplane pilot is likely to encounter. These are the seaplane stop, the float, the dock or pier, and the beach. Each of these calls for a different technique. In addition, it is sometimes, though not often, necessary to assist passengers into a boat.

Ramps, found only at seaplane bases or in the port of call, may be roughly divided into three classes: the stationary ramp, the movable ramp, and the marine railway, which is not strictly a ramp but which calls for the same general type of approach and leave, is considered with the first two.

The stationary ramp is simply an inclined platform leading from the land into the water and ascending well below low water, where there is a tide or other variation of water level. If designed for seaplanes, it should be built of heavy planks laid crosswise, and with the rails or guides set well below the level of the surface. A pilot risking up on the narrow carry lanes, with the bottom of a float. If such a ramp is wet, any ordinary seaplane will slide up under its own power. The working is usually accomplished with a hose, though ladders may be used if a

boat is not available. In many cases, if the ship has plenty of power, enough water will drop off the float, on the way up to lubricate the surface sufficiently. If the ramp is made of concrete, however, it should be touched as lightly as possible, or possibly not at all, and some sort of beaching gear has been attached, of which more soon. After the ship is out of the water on a sudden swell, it is possible by twisting the ramp thoroughly to turn it around by having a machanic hold one wing while the motor is opened up. This prevents serious water shock to the floats, however, and is not recommended except in emergency. If attempted, boards should be placed under the floats at ninety degrees to the level to eliminate the possibility of the keel dropping into a trench.

To start the ship moving on a ramp it is usually necessary to open the throttle nearly all the way and rock the ship back and forth with the elevators. The pilot must be alert, however, and close the throttle the instant the ship begins to move an otherwise two inch speed will be attained in a hurry.

In the case of the movable ramp, such as those installed at the two New York City Skyports, the ship should be moved up until the rear of the floats is just clear of the

water and held there at about one-quarter throttle with elevators down until a machanic puts a block under the rear of the floats to keep the ship from tipping back, or, until the movable is raised nearly to the top. To get the ship off this ramp, the throttle is raised through a total of 180 degrees, and the ship comes off by opening the throttle gently. In leaving a ramp, the pilot should be kept up. If the angle is steep, it will be found that the stern of the float will strike the ramp with considerable force. This should be lowered, and after slowly disengaged by pulling the stick ahead and opening the throttle just as the floats enter the water.

THE MARINE RAILWAY causes less shock perhaps than any other type of ramp. In this, a carriage, wide enough to accommodate both floats with a comfortable margin, is rolled down rails until its upper edge is just above the water. The ship is turned gently into the carriage, which is then dragged out by means of a winch. No sliding on the rails is necessary, as the carriage is brought up to level ground and the ship transferred to some type of beaching gear. Landing, of course, simply reverses the procedure.



If the wind is offshore, the approach is a many-groove problem, but when it is blowing toward the ramp it is best to come in directly down-wind if possible, and as slowly as is practicable. Just before reaching the ramp the throttle should be closed so that contact will be made gently. Care should be taken, however, not to close the throttle too soon for if the wind is fresh the ship will swing and strike the ramp sideways. Rather than allowing this to happen it is better to make contact first at a fairly good speed. If the wind is crosswinding, the straight downwind side will apply. The motor should be throttled at such a point that as the ship starts to weather into the wind it will strike the ramp with both floats at the same time. This calls for superior pilot judgment, but the motor can be easily lowered with a little practice. If the wind is strong and across the ramp it is essential to have someone on land to hold the wing on the down-wind or lee side as otherwise the ship will swing while sliding up. In a gale, it may even slide sideways directly across the ramp, in which case it will be necessary to come up diagonally.

Flying boats may be slid up smoothly like seaplanes, but extra help is on hand the winging floats are

In coming in to a float, the approach should always be made up-wind if possible, particularly if there is no help available. (In this and the three succeeding paragraphs the word "float" refers to the landing platform. To avoid confusion the floats of the airplane are referred to as "postrons".) By proper adjustment of speed and direction, the wheels may be set so that the ship comes up to the float and comes to a stop with the bow at the position or head just touching the float, giving the pilot ample time to stop ahead and secure the ship before it drifts away. Besides to stop, great care should be taken that the motor has not cut off completely to stop when the touch is out. For this reason it is well to allow at least a couple of minutes of idling before contact is made. After the pilot has dismounted, he can turn the ship so that the passengers will not have to get off over the bow.

THERE are many cautions, however, when an up-wind approach is not feasible. In these cases sailing must be resorted to. And here it should be remembered that a little patience saves many a winging. A typical condition is shown in Fig. 8. The diagram is self-explanatory. It should be remembered that the ship used be brought to a stop as it contacts the float, especially if there is (Turn to page 22)

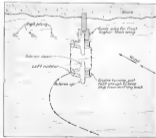


Fig. 8—Baiting across a wing tip

How Far?

III. the Ultimate Maximum Range of Aircraft



Fig. 1—Straight-line distance record

THE existing official world's record for straight-line range stands very much below the maximum range possibilities of several existing airplanes. It has, in fact, been claimed to have been officially broken, and could easily be broken by stripping and overloading one of the latest airline transports. On the other hand, the establishment of transoceanic commercial air service is causing designers to consider more carefully the factors involved in long-range design.

Fig. 1 shows the program, from 244 yards in 1906, for the official

world's record for straight-line range—distance, to 1645 miles in 1931. The less well-known (though more reliable) record of long-range (steep) climb—more recent records the straight-line record considerably, but as the final analysis, it is the actual crossing of oceans and continents which excites interest.

Any actual long-distance flight is of course subject to varying meteorological conditions, but a design study must necessarily limit itself to flight under constant and fairly ideal atmospheric conditions, such as a steady head-wind or more often calm air, with which this article will be concerned.

The question of maximum endurance is at once simpler in, and quite different from, that of maximum range, but the authors do not consider it to be of sufficient practical and general interest to allow space for its consideration in this series of articles. Parenthetically, it must be admitted that maximum endurance does have military value in connection with certain types of missions and it does have political value at a port. But it does not even enjoy the prominence of being included in the principal official world's records listing.

A design study for an extremely long-range airplane usually entails an involved series of calculations and step-by-step graphical computation

However, the fundamentals are included in the familiar Dragout formula

$$R = \frac{W}{D} \left(\frac{C}{D} \right)^{\frac{1}{2}} \left(\frac{1}{1 - \frac{W}{W_0}} \right)$$

where R is the range in miles, obtained by dragout at speeds giving a constant value of the value (L/D) of lift to drag, η is the average overall propulsive efficiency, C is the average specific fuel consumption in pounds per brake horsepower per hour, and W/W_0 is the ratio of the weight at fuel and oil to the initial weight of the airplane. This formula at least gives an idea of the order of magnitude of range attainable in miles or, and illustrates the necessity of combining aerodynamic, propulsive, structural and structural efficiency. (Another important efficiency, i.e., known as plotting efficiency, obviously must be included in a formula.)

MAXIMUM range implies flight at speeds near those for maximum lift/drag ratio. Fig. 2 shows the relationships between this ratio and its corresponding indicated speed, and the parameter involved ($C_{L_{max}}$), the operating parasite drag coefficient, is the ratio of f , the equivalent parasite area, to S , the total wing area; it is at the order of 0.0100 for a "thin wing," and may vary between 0.0150 and 0.0250

The third of a series of articles discussing the upper limits of airplane performance.



By
W. C. Rockefeller
*Instructor in Aerodynamics
California Institute of Technology*
and
Dr. Norton B. Moore
*Aerodynamic Engineer
Douglas Aircraft Company*

for large class landplanes, and between 0.0200 and 0.0300 for large class flying boats. η is Douglas' "airplane efficiency factor," defined in N.A.C.A. Report No. 446, and varies from 0.70 to 0.85, depending upon the type of airplane, the "effective" aspect ratio, $\pi k^2/A$, k is the $W/C_{L_{max}}$ ratio, where k is the span, and A is the "effective" span.

Fig. 2 shows constants of the maximum lift/drag parameters for the Boeing 314 (holder of the straight-line non-stop distance record), and for the Boeing ANT-21 (specially designed for long-distance flights), and for two well-known transport airplanes (indicated speeds shown for these examples are for the usual, or design, weights) (bracketed values are indicated by dashed portions of the general curves

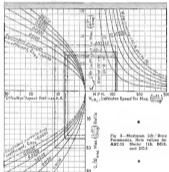


Fig. 2—Maximum lift/drag parameters, show values for ANT-21 Model 11B, B-24, and DC-3

A STUDY of Fig. 2 will illustrate the difficulty of obtaining precise drag values of the maximum lift/drag ratio by any extremely large amount, but some improvement can certainly be obtained by special design. Overall propulsive efficiency may be improved somewhat in the future. But the greatest opportunities for improvement lie with the specific fuel consumption and with the fuel and oil weight ratio.

There is no doubt at the present stage of engine development that the compression-ignition engine is superior to the spark-ignition engine for very long-range designs. Non-

early, the liquid-cooled one at 14-16 spark-ignition engine is superior to the air-cooled radial engine, although fuel rejection shows promise of

bringing the latter in equal footing with the former. Further engine development in all types may alter the relative merits of these engine types (in fact, for very large long-range (Turn to page 72))

How Hard Is a BUMP?

Accelerometers on Airplanes
Tell the Story

An SAE paper by
Richard V. Rhode*
Reviewed by
Edward P. Warner



WHEN the Bureau of Air Commerce set out to make airplane stress analysis safe for the layman, its first move was to replace the arbitrary "factors of safety" as conventional airplane by loads computed on the assumption that the airplane flew uniformly into a vertical gust, sharp-edged and of uniform strength, with the steepness with which it might have struck the side of a building. True, Mr. Rhode, originally responsible for the conventional formula, has produced a new method leading to some striking new conclusions.

Not only that, but he has brought the first public report of the research with the V-g recorder on which the M.A.C.A. and several air transport lines have depended over the past five years, on the actual loads

experienced in flight. The record reproduced shows how utterly the Department of Commerce rule of 30 ft. per sec. for a sharp-edged gust for the worst case that are at all typical of a large amount of flying. They show, too, how rapidly the worst case conditions apparently experienced taper off at speeds above the maximum for level flight, or even (in the case of the flying boat) above the speed of cruising; the explanation being partly in the relatively small proportion of its total lift during which an airplane is flying at above 69 ft./sec. In the superior design that transport pilots display in keeping the speed to moderate figures when they know the air to be rough.

The 30-ft. gust is typical of the worst conditions; but it is not the limit. A cruising DC-3 which flew through a low squall at low altitude a few months ago showed a load factor of -2.5 at 138 m.p.h., according to the first recorder airplane, as appeared gust velocity of 47 ft. per sec. By a curious coincidence, the highest gust velocity de-

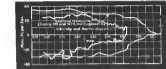
duced from any test previously made as a two-transport airplane was also 47 ft. per sec., the machine being a Lockheed Orion, the pilot Major Douglas, the terrain encountered the altitude "very low," the load factor exposed 5.1. In that case the gust was upward, on the DC-3 downward. The DC-2 showed no sign of structural damage. Thus here meaningless terminology is the typical strength of transport planes.

Mr. Rhode's search for a more refined gust formula had been prompted by a fear that the present method might not do full justice to between conditions widely differing in size and in other characteristics. Anyone who pauses to reflect must realize the physical impossibility of a sharp-edged gust, with the air at one point motionless and that a few inches away rushing along with a vertical velocity of 30 or 40 ft. per sec. The need for a more of gradual transition is obvious, and the explanation being that layer of atmosphere itself gradually to the changing conditions, with a load factor duly reduced below that which would exist if the same vertical current had

been entered with absolute abruptness.

Furthermore, even if the input side were the limit, and if the gust's headwinds were indeed sharp, the conventional formula still would not be correct. Flow photographs of misty airfoils started from rest, and moved through still air, show that they may move some six chord-lengths before the circulation of fluid around the section takes on the appearance that it will keep it a long-continued steady source. Gradually developing circulation means gradually developing force, and the same principle applies when a wing wing within a random eddy in its angle of attack. It may take a considerable fraction of a second for the lift to change to a direct approximation of its permanent value for the new angle and during that interim of time the gradually increasing lift is gradually accelerating the airplane vertically, changing it to the new direction of the apparent wind and partially neutralizing the change in angle of attack that the encounter with the gust actually caused. By the time the lift is built up to an equilibrium value, the equilibrium is for an instantaneous angle of attack. The effect on the load on the wing is then but a part of what it would have been if the gust formula assumed, the adjustment of the relation between the angle of attack and the lift were always instantaneous.

From the work of Wagner and Kuetner on the air in which a 30-ft. gust is so fast built up, Rhode has



These records represent a combined experience of over 20,000 hours of accelerated flying with V-g recorder.

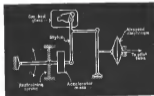
calculated the percentage of reduction of load below the value indicated by the simple sharp-gust formula. With a gust in feet sharp-edged, the reduction, proper from 40 ft. per sec. with a wing chord of 30 ft. and a loading of 8 ft. per sq. ft. down to 35 ft. per sec. with a 1-ft. chord and a 3-ft. loading, from the highest wing loadings are usually found on small airplanes, and vice versa it is cut far off the mark to assume a 32 ft. per sec. reduction in all cases, though for a wing spanwise the figure would be considerable.

The conventional 30-ft. gust required by the Bureau of Air Commerce is thus a 30-second, irregularly proportioned. The 30-ft. velocity is the "reference" velocity which produces certain results; but it actually overstates, even for a sharp-edged gust, in a true velocity of 30 ft. or 44 ft. per sec. In the same way, the 47-ft. effective velocity

thus worked out by the customary method from the V-g records on the DC-3 and the Orion previously mentioned to provide the acceleration readings that they drew past velocities of 69 ft. per sec., had the gusts been sharp-edged.

But gusts are, as already observed, almost to sharp-edged. And when they are not, there is a further reduction. If the transverse area is 400 ft. wide, with the gust velocity increasing uniformly over that distance, Rhode's calculations show a total rate of reduction of load factor ranging from 77 per cent with a 6 ft. wing leading down to 49 per cent at 30 ft. per sec.; the chord length making but little difference in this case.

It is not easy to measure gust strength, but a little progress has been made at Langley Field. So far as it goes, it indicates a buffeting rate increasing in width as the gust increases in intensity—in might have been expected—until reaching a probable maximum of 400 ft. for gusts with true velocity of about 35 ft. per sec. For the most heavily-loaded airplanes, the true added load factor was then but half what they would be if the gust, while keeping the same true velocity, were sharp-edged and able instantaneously to produce its full effect upon the lift; or, in both at the same date, from the opposite side, the effective gust velocity of 30 ft. per sec., traditional in design, represents a true gust of 66 ft. per sec. For a light plane with a 6-ft. wing leading, the 30 ft. effective would be 139 ft. true; a higher vertical velocity than has ever been suspected by manufacturers to exist anywhere outside the seat of a runway.



How the V-g recorder works. From the record based on the recorded gust, some of actual gust velocity and actual airplane speed (shown above) may be calculated.

(Turn to Page 60)

*Presented at the Society of Automotive Engineers, at its annual meeting. The article records errors corrected, and the direct deductions from the mathematical work, see Mr. Rhode's *Form of the conventional and actual values of airplane behavior, later has been issued by the committee.*

is called broadcloth or soft ground ladders. The ceiling is rounded at the sides and rear and new hardware, window moldings, instrument panel, and lighting fixtures add to the air-craft of design.

Two side doors, long steps and fixed coast gear facilitate entrance to the cabin. The rear seat for three persons is 52 in. wide. The seats have been lengthened to provide more leg room. All seats have been made higher to furnish additional support for back and shoulder. Tail seat may be adjusted fore and aft and the back may be set in three reclining positions. Backrests also are adjustable. The self-lighting, separate luggage compartment has been enlarged.

Ventilation and sound absorption have been greatly improved. Fresh air under pressure is fed into the cabin from doors in the wings. Fans also are provided in the cabin and pressure, flow direction, and temperature are controllable. The air outlet is in a low position forward, sucking engine heat out of the cabin before it reaches the passengers. Since it was unnecessary to use the radiator for ventilation, it became available to deicing the cabin windproofing. The floor forward will between the engine compartment and cabin, the sides, and headings have been generously staffed with jacks of proven flow. Together with the dead air space, these pads resist the transmission of sound from the forward part of the fuselage to the cabin.

Load-carrying capacity has been increased by the use of convertible pitch propellers and the ship is available with either the Lycoming-Scott or Hamilton Standard types. Other equipment includes electric starters, trimmers on most models, dual

Scoutla ignition, rubber crutled motor mounts, and a device used by the airlines to eliminate carburetor icing and heat the engine oil in cold weather.

Like other Stinson airplanes the new Reliant has metal wing and fuselage structure and fabric covering. The fuselage is of conventional welded chrome molybdenum steel tube construction. The wing is built

up of two spars the front of welded chrome molybdenum steel, the rear of duralumin. Ribs and leading edge are also of dural and composite struts are steel tubes.

Wired for production late in 1935, the Stinson factory is now delivering the largest haulage of December orders in the corporation's history. Specifications and performance of the several models follow:

Model, Engine, Propeller	1500 141 hp Lycoming Two-Stroke	1600D 141 hp Lycoming Two-Stroke	1600E 150 hp Lycoming Two-Stroke	1600G 141 hp Wright Two-Stroke	1600H 141 hp Wright Two-Stroke
Span	41 ft. 10 in.	41 ft. 10 in.	41 ft. 10 in.	41 ft. 10 in.	41 ft. 10 in.
Length	27 ft. 7 in.	27 ft. 7 in.	27 ft. 7 in.	27 ft. 7 in.	27 ft. 7 in.
Height	8 ft. 1 in.	8 ft. 1 in.	8 ft. 1 in.	8 ft. 1 in.	8 ft. 1 in.
Weight empty	2407 lb.	2407 lb.	2407 lb.	2407 lb.	2407 lb.
Useful load	1200 lb.	1200 lb.	1200 lb.	1200 lb.	1200 lb.
Gross Weight	3607 lb.	3607 lb.	3607 lb.	3607 lb.	3607 lb.
Cruising Speed (Optimum Alt.)	142 m.p.h.	142 m.p.h.	142 m.p.h.	142 m.p.h.	142 m.p.h.
Rate of Climb	800 f.p.m.	800 f.p.m.	800 f.p.m.	800 f.p.m.	800 f.p.m.
Service Ceiling	12,000 ft.	12,000 ft.	12,000 ft.	12,000 ft.	12,000 ft.
Range	411 mi. (100 lb. fuel)	411 mi. (100 lb. fuel)	411 mi. (100 lb. fuel)	411 mi. (100 lb. fuel)	411 mi. (100 lb. fuel)



1—Wingless design with dual 2—Gas tanks 3—Convertible motor mount 4—Hamilton Standard type 5—Hamilton Standard type 6—Electric starter 7—Electric starter 8—Electric starter 9—Electric starter 10—Electric starter



Left: This sight is my high priced automobile. Above: The instrument board is compact and convenient and the vision is good.



Edo Amphibious Gear

New type of seaplane float incorporates retractable wheel

One shock strut in a small truck extended under the deck. Cocks are operated on tension by a handle in the pilot's cockpit through an irreversible worm gear and rotate through 180 deg., locking in both "down" and "up" positions. The wheels mount completely new spacers in the float bottoms. Besides

one tied into the control system, wheels are well forward of the c.g. and a secondary step is placed ahead of them to shield the bottom opening from water interference. The wheel compartments are air tight at the top to the buoyancy of raised through down lift effect. Heavy loads at all working points on the bottom make it possible to use the ship as a seaplane.

Added shock is used in conjunction with specially treated duralumin rivets, cranks and extended sections. The familiar longitudinal lines on the forward bottom are displaced by the use of the secondary step. The simple monocoque structure and all of the features for simplified maintenance in standard life boats are retained. Additional weight of wheel gear totals about 175 lb.

Two models will be produced this season to provide for ships in the 4.5 plane class weighing 1,500-4,000 lb., of Pancher, Hinson and Waco manufacturers.

More Flying Equipment Co. Sept. 10.



Left: New section of float is hinged. Right: In wheels down position.

The wheel retracting mechanism and the hinged rear section.



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Waco has always been America's most popular airplane. Latest Bureau of Air Commerce figures show nearly fifty percent more Wacos in licensed operation than any other make, regardless of price . . . A Waco demonstration will show you the reason.

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© A recent picture taken at Union, N. Carolina, showing Wacos prominently among other

Dragon Bomber

North American ship has long range and large load capacity

D. W. (TOMMY) COMBESON recently stepped out of his role as vice-president of TWA head coach to run a series of flight tests on North American Aviation's new "Dragon," a long range, heavy bomber built to the specifications of the Army Air Corps. Designed and built in strict secrecy at the plant on Los Angeles Memorial Airport, the new bomber is said to exceed in range and load capacity any airplane of its type ever produced. It was designed under the direction of J. H. Kistlerberger, president of North American, J. H. Atwood, chief engineer, and Carl Hensen, project engineer.

The Dragon is a twin engine (P & W, 1,200 hp) medium monoplane having a wingspan 12 ft deep and 7 ft wide at the maximum section. Accommodations for a crew of six are provided to run the elaborate bombing equipment and defensive armament. Control quarters are heated, ventilated, and sound-proofed, the cabin being sealed for constant at high altitudes. Two beds are provided to permit a portion of the crew to sleep during long trips. The pilot's control room is exceptionally large, having adjustable passenger type upholstered seats for four—ship's captain, pilot, co-pilot and observer. 1,300 ft of measured visibility is insured and maneuverability is improved by elimination of separate fuel tank—gasoline is carried in the central portion of the slim streamlined wing. The receiver antenna of low impedance is sealed with DuPont Concentration of the fuel had near the wing improves the maneuverability.

Wing panels are of single spar stressed skin construction. A new type of flap with automatic hydraulic control provides good speed range and low landing speed. To reduce control load and insure against flutter the ailerons are balanced aerodynamically, statically, and dynamically.

Four-engine construction is semi-monocoque. In spite of the large cross section it is provided with

and both rights, the streamlined characteristics have been refined to the point where drag is low.

Provision is made for either the Curtiss or Hamilton Standard type of three-blade, constant speed feeding propellers, equipped with single rings for ice prevention

Landmark features are also part of the equipment. The Sperry automatic pilot is also included.

Landing gear is simple and rugged. It is retracted hydraulically but may be operated mechanically in emergency through an independent system.

Defensive armament is designed so that 3 to 5 guns can be brought to bear on any point around the airplane to defend it against pursuit attack. Gun rooms are designed to operate efficiently in the rarified atmosphere at high altitudes.

The ship will be entered in the Air Corps competition next month.



The B-27, Dragon Bomber by North American



The North American Corp and Army Observation Plane.

N. A. Observation Air Corps buys 120 ships of New Type From North American

SECOND ARMY CONTRACT covered by North American Aviation Inc. within a month a for 120 Observation planes of a design that won the recent Air Corps competition at Wright Field. Production on this model will begin next summer.

The three-place Corp and Army Observation plane is of the all-metal, and wing type. In its design the specific requirements of the observer

have been kept in mind. In addition to the observer, a pilot and gunner are carried. The observer has ample room for photographic work, mapping and general observation. He also has an upper position for radio work and relief seating. The gunner is located in the rear for defensive purposes.

Contributing to the performance of the ship are retractable landing gear and tail wheel, streamlined fuselage and improved tail group here, and a specially designed engine cooling.



ONE FOR AL



Grumman builds special aerobatic
Gullhawk for Al Williams



The Grumman Gullhawk is a high performance aerobically designed aircraft for Al Williams

DESIGNED-PARTICULARLY for high performance and aerobically but also adaptable for cross-country flying, Al Williams' new Gullhawk has just been completed at the Grumman factory. The new Gullhawk (Model G-32) has no unusual structural features. It is built to high load factors and has an exceptionally large tail for maneuverability. The engine is a Wright Cyclone G with a 3-blade Hamilton Standard constant-speed propeller.

Among the outstanding features is the equipment for upside down flying. Landing gear and all lines have several models one of which is at the geometric center of the tank in each case. A second scavenger pump and fire drain lines have been added to the regular engine installation by the use of this equipment. It is

possible to fly in inverted position for about one-half hour.

Special accessories include an improved model of the Coffman Canister Starter (Aircraft, Oct. 1936) with the bench in the cockpit where it can be loaded by the pilot. Other equipment includes a Sperry Aviation Harmon Directional Gyro and a Cambridge Exhaust Gas Analyzer.

Dimensions and specifications are as follows:

Span (wing tip to wing tip)	35 ft. 5 in.
Length overall	23 ft. 11 in.
Gross weight (44 gal. fuel)	4,196 lb.
Gross weight (44 gal. fuel)	3,582 lb.
Maximum speed (10,000 ft.)	250 m.p.h.
Cruising speed	200 m.p.h.
800 m.p.h. range	200 m.p.h.
1,000 m.p.h. range	200 m.p.h.
1,500 m.p.h. range	200 m.p.h.
Rate of climb	3,000 ft. per min.
Cooling	1,000 ft.



CURTISS - WRIGHT CORPORATION
CURTISS AEROPLANE DIVISION
BUFFALO • NEW YORK

The Great Silver Fleet

GREATER STILL



WITH NEW DOUGLAS TRANSPORTS

Step out of winter into the warm comfort of one of Eastern Air Lines' latest Douglas Transports... and you will be in Florida in less than eight hours. * Augmenting its Douglas service already famous from New York, Philadelphia, Baltimore, Washington and Chicago to the South, the Great Silver Fleet is greater still with

three larger, faster, even more luxurious Douglas planes. * Equipped on 55-foot wings, completely soundproofed, stress tested and equipped with adjustable dress chairs for 21 passengers—these latest Douglas Transports are the world's most advanced method of transportation. Douglas Aircraft Company, Inc., Santa Monica, Calif.

WHEREVER YOU GO, TRAVEL VIA LUXURIOUS DOUGLAS EQUIPMENT

In AMERICA... as American Airlines, Inc., Eastern Airlines, Inc., Pan American Airways, TWA, Inc., United Air Lines and Washington-Capitol Airlines, Inc.
In THE ORIENT... as Japan Air Lines

port, Cross National Airlines Corporation, and K. N. L. L. M. in the Netherlands Indies
In SOUTH AMERICA... as Pan American Ocean Airways
In EUROPE... DELTA in America, Swissair

Lufthansa in Germany, K.L.M. in the Netherlands, L.A.P.E. in Spain, LOT in Poland; C.L.S. in Czechoslovakia, Air France in France, and British in England.
In AUSTRALIA... Imperial Airways

The World Standard Air Transport

DOUGLAS

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Fabric Rejuvenator

New Solution Gives New Life to Old Dope

QUALITATIVE TESTING HAS BEEN MADE before removing fabric-covered surfaces have been treated by the new Fabric Rejuvenator, recently introduced by Berry Brothers, of considerable help. This product gives new life to old dope, seals cracks and breaks and tightens up fabric finishes according to wear from the manufacturer—*Aviation*, February, 1937.

Exhaust Analyzers

Two Instruments For Exhaust Analysis Employ Different Principles

TWO NEW EXHAUST ANALYZERS, each of a distinctly different type, recently have been placed on the market.

The Fremont Company, of New York, announces the *Kerosene* which operates on a mechanical principle based on the knowledge that the specific weight of exhaust gases varies with changes in the air-fuel ratio. This principle has been proved as practice by *Rayburn*, C.B., inventor, as well as both stationary and airplane steam power plants. The instrument works on the basis of displacement whereby the weight of air with the weight of the exhaust gas, through means of electric drives, force and impulse wheels linked through differential gears to an indicator on which the scale is calibrated in terms of air-fuel ratio. The instrument is of rugged construction and is readily portable. It may be operated from the standard lighting circuit or, with a 6 volt DC source, it will operate for a maximum of five hours on a single charging of a standard automobile type of storage battery.

Also of rugged construction, and readily portable, and even requiring



TEL Tachometer with engine time register

no electrical connection, is the new *Hayes* instrument offered by The Hayes Corporation, Malaga City, Indiana. The instrument is simple in operation, has no moving mechanical parts, and requires no shell on the part of the operator. Using a diaphragm principle, the *Hayes* exhaust gas analyzer runs a sample of the gas to be analyzed by passing it through an diaphragm chamber filled with minute pots, which absorb all of the carbon dioxide, the vacuum produced being used to operate a pointer revolving on a large scale which is calibrated in terms of CO₂ percentage. The measurement scale has a sample of gas may be analyzed in twenty seconds by this method—*Aviation*, February, 1937.

Neoprene

New House for Synthetic Rubber by Du Pont

Recently sold by E. I. du Pont de Nemours & Company under the trade name *DuPont*, the synthetic rubber now widely used where resistance to the deteriorating effects of oil, greases, solvents, refrigerants, heat, sunlight and water are of im-

portance, is being substituted under the generic term neoprene.

The new name neoprene is not trade marked and may be freely used by rubber manufacturers to describe products which embody the distinctive characteristics of this unique material—*Aviation*, February, 1937.

Tachometer

New Hayes TEL Tachometer Incorporates Automatic Engine Time Register

A NEW CIRCULAR PURPOSE TACHOMETER of chronometric type is introduced by R. W. Hayes & Company, Inc., 57 Irving Place, New York City. American distributor for the Hayes Hayes tachometers. Unique feature of the new instrument is the non-removable register, automatically recording engine running time. The counter reads up to 999 hours 59 minutes and at 1,000 hours it starts from zero again—*Aviation*, February, 1937.



Recent Exhaust Gas Analyzer Made by Fremont

UNITED AIR LINES'

new \$3,000,000 fleet equipped with

MACWHYTE AIRCRAFT CABLE



Macquayte salutes this new standard in fast, comfortable air travel. We are proud of the part we have played in equipping this great new United Air fleet.

Macoshyte Aircraft Cable is precision made in our own plant on special aircraft cable machines. This modern equipment is used for making both P&E formed and non-formed cables. Manufacturing operations are under the close supervision of metallurgists and engineers. Tension, torque, bending, fatigue and corrosion tests are constantly made in accordance with the latest A-N specifications in order to produce the most dependable, longest wearing cable possible. Write for Aircraft Cable, Bulletin 100.

Macguyve Tie Rods

- Standard
- Square
- Round

Made in accordance with A/N specifications to meet all trends, loading and off shore requirements.



**MACWHYTE
COMPANY**

Knolls-Warman Specializes in the manufacture of Cable Ties, Racks and Braced Wire Rope Slings for Industry.

Operators' Corner

An exploration of ideas on the problems of the noncommercial aviation industry

QUESTION 28- Do you believe that a spurious witness should be required to testify in person? If so, what conditions have should be applied? Should the number of hours needed for the witness to test for the transport witness or plaintiff? Should some estimate of ability to testify knowledge be included in the review?

providing he has the right temperament and, if he has not, he will not get away students. There is no way that I see to check on the ability of an instructor to impart knowledge unless an instructor's school, as mentioned above, is available.—FRANK HARRIS, *chief pilot, Kensington School of Aviation and Executive Recs., Kensington, Pa.*

Need Special Notes

ALL INSTRUCTORS IN AVIATION should have special licenses, and the hours required should be greater than in transport as this work cannot be done right even by old transport pilots. It takes a man with a special make-up to do this kind of work, and he should be made to put in as many hours a year to hold his license or rating. Our future pilots depend on their first instructors and so does aviation.—W. H. WISSEMAN, commercial pilot, Wintney, Mass.

Top Film is Bold

WE DO NOT BELIEVE that a special license should be required for flying instructors. We think that such a requirement would decrease the possibility of expanding aviation activity throughout the country, which we now find progressing in an encouraging pace. In order to give flying instruction, a pilot should be able to pass two requirements, that is, first—he should have a transport license, and second—he should possess a certain personality and mental attitude that will enable him to do his work correctly.

The Department is now taking care of transport regulations. The second requirement is something that has to be worked out by itself in each locality. In the case of established schools, the management usually make certain that their instructors have that certain personality and moral attitude. In the case of the individual operators, the question is usually settled by the customers themselves. A successful instructor produces successful students, therefore, if an instructor does not show good results, he will soon be eliminated by the simple process of not having enough business to enable him to continue operations.

We do not think it fair to struggle ourselves with a regulation that hinders us so far a point as the difference between good and perfect.

The bad usually seems to alternate themselves—J. P. Donovan, Manager, Associated Air Service, Ltd., Palo Alto, Cal.

An Unusual Excitation

There is bound to be a difference of opinion as to matters of astronomical policy. It is the opinion of many in our company that we have sufficient funds and capabilities at the present time to properly govern the industry. This also applies to the question of an International Bureau. Without doubt there are those in the art of transport business by air-crafts. However, any consideration in this respect are a question of reinforcement of existing laws and were in maintaining application for licenses.

The number of hours and the training required for a transport license should be sufficient to train an instructor. A pilot that is inherently (such as an instructor) will soon choose another line of work, if he is properly qualified as an instructor he should be able to teach students how to fly safely regardless of the type of aircraft for instruction.

It would seem wisest to unite the industry with a multiplicity of regulations.—ARTHUR S. PRINCE, *Tampa, St. Petersburg, Fla.*

Next Month's Question

QUESTION 11: Should a private pilot be allowed to carry and distribute alcohol in limited amounts? Why? Why not? Please explain your answer. Name any legislation with this problem? What is your solution?

How does the new Intelligent Penicillin E. Section 49, Bulletin 7, of the Air Condensed Bureau, which states that a private pilot may not, but may without penalty?

Submitted by E. E. Smith, Mesquite, California; Robert Cunningham Co., Adams, Mass.

AVAILABILITY
February, 1981

News of the Month

Highlighting recent events in the aviation world

Accident Series

Operators and Federal units move to make corrective action on recent rash of lives losses

Disaster disrupted I.C.C. considers all line service for Airlines. Last two of American's DC-7s scheduled for delivery. Series of accidents closes 32 lines.

America and America W. A. Hamilton, chief of TWA who AVIATION'S annual conference opened.

Research N.A.C.A. mounts report operators need to express. Radio lines are said to be main concern.

Foreign Disaster progress in Asia line air boom.

Ways Deduct 45 Yeagor coast-bombers.

Industry Lockheed expands. Taylor plane production of 1,000.

For a season or a season, from the middle of December until the middle of January, the gods of chance seemed to fawn on air transport operators. In that brief period five U. S. airlines suffered accidents—four with attendant loss of life.

In six crashes there were 51 people involved. Of these 32 died (15 crew, 17 passengers), seven were injured (3 crew, 4 passengers), and twelve were injured (3 crew and 9 passengers).

First mishap was to a Western Air Express liner, which disappeared with seven aboard on a B94 between Los Angeles and Salt Lake.

Three days later, Dec. 18, a Northwest Airlines Lockheed Electra, flying between St. Paul and Seattle, crashed as it approached at 4:39 A.M. a few miles south of the spot where the United crash had occurred. Of the thirteen persons on board, nine were killed outright and two more, among them Martin Johnson, the engineer, and captain Clifford P. Owen, later died. The other eight sustained various other injuries or were severely shaken.

On Dec. 21 the wreckage was sighted from the air on a ridge 15 miles south of Kellogg, Ida.

The next crash in the series had no recent consequences except the loss of a ship. On Dec. 19 an Eastern Air Lines Douglas, Northbound to New York from Miami, ran into heavy weather at Cauden, N. J., finally wound up on a ridge northwest of Fort Jervis, N. Y., 50 miles west of its goal. Pilot Henry T. (Dick) Merrill had bought the ship in French an eighth of a mile at once, removing both wings and motors, but leaving fuselage and passengers almost intact.

A crash on Dec. 23 cost the lives of six Boeing Airways employees, including Donald C. Walbridge, operations manager, and Stanley Perry, superintendent of maintenance. One of Boeing's Lockheed Electras was undergoing a test flight following installation of an overhailed right engine at Love Field, the Dallas Municipal Airport; the ship crashed after failure of that engine.

The next two accidents raged the skies. Each occurred in the metropolitan region north of Union Air Terminal, Burbank, Cal. On Dec. 27 a United Air Lines Boeing crashed to Los Angeles from San Francisco, carrying nine passengers and crew of three, struck a high steel bridge,

only twenty miles from the Burbank terminal. Next day all twelve aboard were found dead in the twisted fuselage. The crash occurred during a violent storm which was sweeping the whole western seaboard. It was the first fatal accident suffered by United in seven years of operation on the Los Angeles-San Francisco run.

On January 12 Western Air Express suffered its second crash within a month, after a record of ten years without fatality. The usual was a few miles south of the spot where the United crash had occurred. Of the thirteen persons on board, nine were killed outright and two more, among them Martin Johnson, the engineer, and captain Clifford P. Owen, later died. The other eight sustained various other injuries or were severely shaken.

One of the appalling consequences of accidents turned into a traffic menagerie's hair gray, not set up an automatic engineering as to the cause, not only from traffic operations and government, but from its alarmed public in well. Every case shows failure of the Department of Commerce radio facilities to indicate jolting among pilots to complete schedules has been put forward.

Following the Eastern Air Lines midday, E.A.L.'s general manager, Captain R. V. Rosenbush, wrote a letter to Assistant Secretary of Commerce J. Maurice Johnson, suggesting four recommendations that should be made in Department of Commerce and airline radio systems. "In my opinion, such a job as recommended above, in comparison with those now in use, will eliminate 75 per cent of the possibility of such accidents as occurred to Dick Merrill of Eastern Air Lines," said Captain Rosenbush.

Colonel Johnson, in reply, admitted general accord with Rosenbush's suggestions and urged "vigorous effort" on the part of the airline operators to improve their own radio equipment, install distress equipment, and thoroughly substantiate flying personnel to flight flying methods recommending courses on the line trainer. He also promised continued effort on the part of the Commerce Department to secure from Congress the necessary funds for improving its navigation facilities. He recommended that a conference between airline operators and officials of government departments having a hand in aircraft operation would be called in the very near future.

Jan. 12, in particular, caused an announcement from the Department of Agriculture to the effect that 100 new off-the-shelf weather reporting bases had been set up. They will report on hourly observations to Oakland or Chicago where they will be relayed over the radio-weather system. Twenty other stations have been equipped for more intensive service.

From some quarters came the complaint that the airline's trouble was the result of faulty equipment of the Commerce Department's radio bases, due to weather conditions which set up even or more slow in the receiving system.

To overseas aviation technicians with interest, TWA has recently installed in all its ships a radio direction finder, consisting also an automatic loop antenna, developed by TWA engineers. After an elaborate test over the system, Roger L. Vahl, Bureau of Air Commerce Director, wired TWA president Fife. "From all our reports it appears that TWA, but not only apparently eliminated cause and risk factor from radio reception but is operating satisfactorily a new direction finder and bearing device." Opening of the device depends on the familiar directional characteristic of a loop antenna.

American Airlines is moving to meet the difficulties of team service by supplementing navigation equipment with the new radio compasses developed by Bendix. To insure proper operation of Federal aid systems, Captain E. J. Copleland of the Senate Commerce Committee said his Air Safety Subcommittee would recommend to Congress appropriation of \$100,000 to improve weather reporting and radio facilities and further.

A bill has been introduced in the Senate by Nevada's Sen. Pat McCarran which would place air traffic regulations under the I.C.C., instead of the Bureau of Air Commerce as is present.

Aviation's Award

Honorary of TWA recognized for maintenance achievement

WALTER A. HAMILTON, chief maintenance supervisor of TWA, has been the last three years chairman of the A.C. of C and the A.T.A. Maintenance Committee, was selected as the recipient of Aviation's Main-

tenance Award for 1937. Presentation of the honor plaque and certificate was made by Col. Frederick L. Martin at a dinner held late in January at the Hotel New Otis at Dayton, Ohio.

Hamilton has been active in the field of aircraft maintenance for many years. Under his guidance TWA's first overhaul and overhauling plant at Kansas City has been built up and operated on such a high level of efficiency that it has become a standard of comparison for maintenance shops all over the world.

The meeting at which the award was made was one of the regular semi-annual winter-holiday conferences held by members of the Army Air Corps, at Wright Field. Representatives of the Army and the Navy and other governmental services met with the Maintenance Committee to discuss common problems. At the end of the session Chief War of United Air Lines was elected national chairman for the coming year, replacing Walter Hamilton. The committee elected C. S. J. French, Assistant Chief, Engineering Section, Wright Field, as its second honorary member.

N. A. C. A. Report

Urges expansion of American research facilities

CAUTION ATTENTION is urged in the publication of basic research efforts on the part of American aviation, the National Advisory Committee on Aeronautics. In its annual report to the President, urged "the wisdom and ultimate economy of its policy



THE ANNUAL AWARD
"In recognition of outstanding achievement in the field of maintenance."



HAMILTON, HAMILTON
at TWA was AVIATION'S annual maintenance award this year.

(of expanding its own research facilities) to the best insurance against falling behind in the development of an instrumentality as vital to national defense and so effective in the protection of commerce and in the advance of civilization."

The report points out that within

the past year its new 300-mile-an-hour wind tunnel, which has more than met its designed performance, has been put into service. The 2,000-hp. tunnel will be the study of hydrodynamic characteristics of boats and hulls is being increased to a length of 2,800 ft., which will permit water speeds up to 40 mph.

Transport Service

American petitions ICC for off-line routes.

PCA says 10 changes

THE ICC HAS overruled a motion by the selector for the Post-office Department that the Census and Census American Airlines petition for establishment of off-line service between Detroit and Indianapolis for west of Philadelphia. American has also applied for permission to establish service between Detroit and Cincinnati. Both Eastern Air Lines and Pennsylvania Central Airlines have applied to the Commission for permission to increase Eastern's routes to the only one that has been granted at the time of writing.

American Expands—The final set of American Airlines' 38 Douglas DC-3's are scheduled for delivery beginning the last two weeks of this month. Already in service are eight 14-passenger airplanes and twelve 20-passenger jet planes. All the airplanes are being equipped with the new Bendix radio beacon compass.

PCA expands—Ten Boeing 280-D transports have been purchased from United Air Lines by Pennsylvania Central Airlines. They will replace Stinson A's and Boeing 20's formerly used by Central Airlines and Pennsylvania Airlines. PCA's new maintenance base and operations headquarters will be located on Pittsburgh's Allegheny County Airport starting about January 15. Flats, Mich., was scheduled as one of the major stops on the Pittsburgh-Detroit Milwaukee route of this progressive company.

WEE DC-3's—Western Air Express has ordered two 24-passenger Douglas DC-3 sleeper planes, at a cost of about \$24,000. Scheduled will come to be in use with United at Salt Lake City, offering several equipment for service from southern California to Salt Lake, thanks to the east route by way of United's mid-continent route.

Radio Research

Bendix Aviation forms new radio unit for extensive research.

THE BENDIX AVIATION CORPORATION has constituted four radio and research equipment companies into a new unit to be known as the Bendix Radio Corporation. The new organization will specialize in radio equipment for communications and navigation purposes for the aircraft industry, with particular attention to blind flying and safety in landing under adverse weather conditions. Vincent Bendix will be president and other executives will be drawn from the four companies making up the new unit.

Included in this group is L. A. Higham, of the Radio Research Company, vice president and general manager; Roy T. Harley and W. P. Hillard, vice presidents; C. E. Mead, vice president and works manager; Walter J. Barnett, treasurer; Henry Goetz, secretary and W. R. Houghton, controller.

The companies which form the new Bendix unit are the Radio Research Company, Inc. of Washington, D. C.; the Radio Problems Co. of Dayton, Ohio; the W. P. Hillard Co. and Jenkins & Adams.

The new company will have plants and laboratories in Chicago, Dayton, Washington and Oakland, Calif., and will be staffed with more than 100 engineers and technicians.

One of the major benefits to be derived from such large-scale research facilities, according to Mr. Bendix, will be availability of the resources and manufacturing experience of the group organizations. He also listed reduction of the cost of radio equipment for the private plane operator.

Navy Voughts

46 scout-bombers of SB2U type ordered for fleet service

ONLY MILITARY ORDERS OF THIS MONTH came from the Navy and went to Chance Vought aircraft. The order of United Aircraft Corporation is for 46 scout-bombers, heavily similar to the SB2U-1, of which 84 were delivered last year.

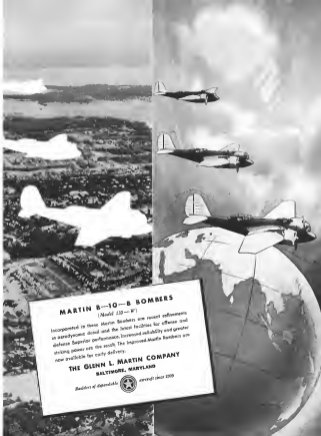
The plane is a two-seat biplane of metal structure, fabric covered. Power is derived from a 200-hp., 14-cylinder Pratt & Whitney Twin Wasp Jr. engine, delivered through



PENNSYLVANIA-CENTRAL

has just purchased two of State Boeing DC-3's from United Air Lines for use on the Washington-Wisconsin route.

REPRINTED
February 1937



MARTIN B-10-B BOMBERS (Model 110-W)

Incorporated in these Martin Bombers are recent refinements in aerodynamic design and the latest facilities for offense and defense. Superior performance, increased reliability and greater striking power are the result. The Improved Martin Bombers are now available for early delivery.

THE GLENN L. MARTIN COMPANY
BALTIMORE, MARYLAND

Builder of dependable aircraft since 1909





● The extent to which manufacturers depend upon the Nickel Alloy Steels to give long life and reliability to aircraft engines is testified to by the fact that some of these engines contain as many as fifty Nickel Steel parts... Their superior toughness and strength, together with their high resistance to fatigue and stress, make the Nickel Alloy Steels the standard materials for highly stressed engine applications in the aircraft of every country.

NICKEL ALLOY STEELS

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N.Y.

Hamilton Standard materials push propeller

Specifications and performance figures for the 5200-S, which have been built here with 4, are as follows: span, 23 ft 7 in.; length, 27 ft 6 in.; gross weight, 5,528 lb.; top speed, 205 mph at 5,900 r.p.m.; landing speed 65 mph; service ceiling 24,000 ft.

Canada's Air Force 1957 estimates call for doubling man power

As a result of a declared policy of expansive flight expansion, Canada in January announced a policy of greatly increasing her military strength in the air. Estimates which were submitted to the Department of Defense on Jan. 15 called for an increase of over 100 per cent for the Royal Canadian Air Force, providing for expansion in every branch of the service.

Total defense estimates call for an expenditure of \$199,000,000 of which \$11,200,000 is for the R.C.A.F. This compares with only \$4,685,000 in 1956.

Personnel of the permanent air force will be increased from 147 officers and 553 airmen to 798 officers and 1,408 airmen. With similar increases in the non-permanent force, total strength will be 351 officers and 2,645 airmen.

Hughes Record

Twins Wing B powered new line L.A.-N.Y. in 7 hr. 25 min.

Even ARMED AND DANGEROUS, Hughes' new Cyclone powered Northrop Gamma (from Los Angeles to New York) in nine hours and a half a year ago. Last month, almost exactly a year later, they were

even more amazed when the second year's new production line had increased by two hours. This time he flew the 2,690 miles non-stop in the remarkable time of 7 hours 28 minutes 25 seconds, to maintain an average speed of 332 miles an hour.

This time he flew the route of his own design with which he set the present world landplane speed record of 454 miles an hour in September, 1955. It is powered with a Pratt & Whitney Twin Wasp, Jr., delivering 1,500 hp.

Over Waterloo, Arco the airplane's governing the flow of oxygen to his face mask failed to function properly and he found himself feeling dazed. He coasted down to 10,000 ft., trying to relieve the pressure in his ears, and was once feeling all right again. He had intended to stop at Chicago, but weather was so good, and had compromised to fly the distance to make it to Newark non-stop, crossing the finish line at 12:40:25 p.m.

Industry Notes Several factories expand. Taylor expects to produce 2,500

After discussions, Continental has moved its manufacturing facilities from Long Beach, Cal., to Metropolitan Airport, Van Nuys. A new company is being formed which will acquire a 20-acre tract and a number of buildings which will provide about 10,000 sq ft of floor space.

Present plans call for production of 25 Aerostars. The company is negotiating for the granting of non-subsiding licenses in Great Britain and Canada.

Lowest expansion—After losing its present factory and site at Burlington, Cal., for more than four years, Lockheed Aircraft Corporation has expanded their facilities together with several acres of adjacent property, at a cost of \$144,000. The new site located on a 25,000-sq-ft order backlog—400 per cent greater than a year ago—an extensive expansion program is in progress.

Lowest sales—which is the number of Taylor Aircraft Company of Brentford, Pa., expects to manufacture and deliver 1957-1958 about a 100 per cent increase over the year before, a total of 550 Cuts having been turned out.

First reorganization—Taylor Aircraft of Canada, Ltd., has been incorporated under Canadian law as Fleet Aircraft Ltd. Authorized stock

Traffic

Least available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only



AIR TRANSPORT INDICATOR
Jan. 1, 1957
117
—which is the ratio of average passenger miles for December 1956 as compared with the corresponding figure for 1955. 1954.

For December 1956 the indicator stood at 123.7

LONG AWAITED—NOW AVAILABLE

EDO AMPHIBIOUS FLOAT GEAR

First to be licensed by the U. S. Bureau of Air Commerce



Float gear enabling you to land and take off from either land or water? Interchangeable with regular wheel landing gear so that your plane need be amphibious equipped only when required. These interchangeable floats long sought by plane owners are now offered by Edo's Amphibious Floats—wholly new in design—constructed in efficiency.

The years of research and testing have gone into this Edo Amphibious Float gear, the first to be licensed by the U. S. Bureau of Air Commerce. Whether, springing by landing shock waves, raising wholly within the float, with the upstroke obtained from water action by a secondary step. Efficient landing gear provided. The floats are carried by also shock waves built into a hinged rear section of the floats which are curved downward, forward with floatline, and transformed by rollers into a modulation and wheel and steel. Minimum resistance on the water through the unobstructed use of this reversible water rollers in this way assisted even at low landing speeds.

Edo Amphibious Floats offer loads economy and safety because with them you never drop can now be purchased as an amphibious float with this gear, a plane retains the well known airplane advantages of easy handling—quick take-off—placidity in case of damage—good vision and passenger comfort, isolated from waves and spray—rafts due in built-in water right compartments. Yes, when desirable to change back to straight wheel gear the plane needs no airplane ramp facilities can be landed as your home airport and the change-over made in a few hours time.

Edo Amphibious Float gear will be available too poor as ships in the 4-5 place class. You are invited to communicate with the manufacturer or distributor of your favorite float for full information regarding his product to equipped.

EDO AIRCRAFT CORPORATION
165 Second Street, College Point, L. I., N. Y.

was increased from 10,000 shares to 100,000 shares, which will give the company a capitalization of \$4,000,000. The float was originally a Consolidated Aircraft Corporation subsidiary, as incorporated, it will be entirely controlled and primarily owned by Canadian interests.

Officers of the new company are: W. J. Sanderson, president and general manager; R. G. McMillan, vice-president; and H. E. Langford, secretary and treasurer.

Business activities.—After formation (Sanderson) have announced a considerable expansion of their engineering department, which was established in 1924. The expansion is to provide facilities for periodic inspection of all make insured by the company. The engineering department is headed by Jerome Leiden, who is also secretary of the Aeronautical Division of the National Safety Council.

Proposed absorption.—Announcement that the Supreme Propeller Company, Wichita, Kan., has been absorbed by Hawley-Hughes Aircraft Corporation, Detroit, Mich., is made by Commander H. H. Green, president of the latter firm. Tests are now being conducted on a preliminary production group of Supreme propellers, some of which are scheduled for display at the New York show. Quantity production of propellers in the low power range is planned for early February. The company is also building a low-engined transport plane for feeder line and general purpose use.

Merits shown.—Glenn L. Martin, president and chairman of the board of the company which built the Dixie American Clipper ships, has an unusual plan for doubling the size of his plant at Middle River, near Baltimore. The program calls for expenditure of \$5,000,000, of which \$300,000 will go for new machinery. Construction plans call for an assembly building 200 ft. wide by 500 ft. long with a minimum height of 40 ft. Mr. Martin says "it will constitute the largest unobstructed airplane factory space in the world."

Transport Abroad

"C" boats improve hospital service, ERILM estimates.

With this trend of the Empire Flying boats, "C" boats in service, Imperial Airways of Great Britain is the 4 (discussed the true role be-

ween Marseille, France, and Brindisi, Italy. The routes to one night, between Paris and Marseille, the same passengers and speed on trans-From Brindisi the route is across the Mediterranean to Alexandria.

Home scheduled.—C. M. L. M., the Royal Netherlands Indies, Air Force, extended these Java routes late last term. Between and Balikpapan 240 miles in Tarakan in Borneo's east coast. The last now stands ready to extend operations from Tarakan to Manila as soon as Philippine aid is granted. The Java-Tarakan service is weekly and is maintained with Douglas DC-2's.

Financial

Second year, because dividends show encouraging upswing

The second year of Douglas Aircraft's fiscal year, ended Nov. 30, showed net sales of \$1,017,000, against a total of \$1,017,000 for the preceding year. The \$7,500,000 net sales for the year were the highest in the company's history. United orders as of Nov. 30 reached a new high of \$24,526,000, compared with \$12,000,000 for 1935.

A Christmas bonus for 1,200 North American Aviation employees also amounted less than \$1,500 a year was announced by President J. H. Kunkler. Employees with a year or more service received \$35 to \$90



A PRESSING PROBLEM
of the Lockheed plant prompted the initiation of this (75-ton) model building program.

Western Air Express directors have declared a 25-cent a share dividend on capital stock. It was payable last Dec. 25 in consideration of record Dec. 15. The last previous payment by W.A.E. was 15 cents a share in 1935.

TWA paid a special dividend of 25 cents a share on Dec. 31.



"CAVALIER" ARRIVES

at Bermuda, where she will shortly start from Trill Bermuda service. This is one of Imperial Airways' Empire flying boats.



BREWSTER'S BIRTHDAY



IN THE FIFTIETH anniversary of the founding of this corporation, the officers and employees wish to express their sincere appreciation to those client companies whose valued trade has made Brewster's success possible.

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Deputy Aircraft Company, Incorporated

Evans Air Line

Elliott Aircraft Corporation

Foran Aircraft Corporation
Foran Aircraft Corporation
Foran Aircraft Corporation

Harmon, Incorporated

First Aircraft of Canada, Limited

Griffiths Aircraft Engineering Corporation

W. H. H. Aircraft Aircraft Corporation

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Spring Aircraft Corporation, Incorporated

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LONG ISLAND CITY

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Schools, Services, and Airports

A state-by-state tour of the flying fields

► **ALABAMA**—Stanley A. Adair, manager of the Birmingham Municipal Airport, has been elected governor for Alabama of the National Aeronautics Association for 1957, according to announcement by Hayden Brundage, acting president. Later the NAA announced that Mr. Adair had been appointed official air meet director for ALABAMA, TENNESSEE, MISSISSIPPI and LOUISIANA.

► **ARIZONA**—Frank H. Robertson has established a fixed-base flying service at Phoenix Sky Harbor, offering student instruction, night-vision video, and charter flights. The Phoenix City Council has contributed \$10,000 to insure a \$100,000 fund from the MFA to all the field, which is quite dear when dry.

► **CALIFORNIA**—Members of the Los Angeles Aviation Country Club have selected San Dimas as the spot for their first air base of 1957, which was scheduled for Jan. 23 and 24. W. F. Shattuck, Sacramento, was expected to take delivery on his new P-51 Mustang late in January. The ship was sold through Duke Hunter, who lives at Sacramento Municipal Airport, by Dick Kuchner, Pioneerfield's West Coast Sales Manager.

► **CONNECTICUT**—John H. Treadwell, manager of the New Haven Municipal Airport, has reported that 1956 was the busiest year the airport has ever seen. Total of flying aircraft reached 1,705, 143 more than in 1955.

► **FLORIDA**—More than 10,000 spectators witnessed the sun-drenched morning flight, West Palm Beach's new \$175,000 municipal airport.

► **ILLINOIS**—Joseph H. Seyler has been named president of the Aeronautics Flying Club, Peoria, replacing Jack Weyner. Other officers are Carl

Wells, vice-president, and Dr. Lloyd K. Wynn, secretary-treasurer.

► **INDIANA**—Newly elected officers of the Evansville Flying Club for 1957 are Harry B. Wagner, president; Fred T. Wharton, vice-president; Marjorie Skelton, secretary; Louis Taylor, treasurer; George Peters, sergeant-at-arms.

► **KANSAS**—A new Taylor C-4 has been purchased by the Fowler Flying Service of Deane, Kan. It was purchased from the State Flying Service, of Winnetka.

► **KENTUCKY**—National Aeronautics, Inc., based at Paducah City Airport, has been named dealer for Taylor C-4s. The company also conducts a flying school. Late in December a \$10,000 lighting system was inaugurated at the Paducah City Airport.

► **KENTUCKY**—Fred E. Smith has purchased a 170-acre tract a mile and a half from Lexington, where

he has been operating an airport. He plans to open a charter service and erect a two-plane hangar.

► **MASSACHUSETTS**—Charles Hamilton, manager of the Rapids Flying Service, Worcester, has purchased a new Taylor C-4 to assist in operations.

► **MICHIGAN**—The Battle Creek City Commission has appointed Keith Wynn, manager of Kalamazoo Airport, L. D. Howerwell, Gordon Kilgus, Ken Thompson, and Russell Bishop have formed the Bishop Flying Service, Inc., which will operate a charter and taxi service at Bishop Airport, Flint.

► **MISSISSIPPI**—The new administration building at the Hattiesburg Airport was occupied recently.

► **NEW HAMPSHIRE**—The city of Concord has leased the Concord



NEW HAMPSHIRE are led to the Concord, N.H., municipal airport.

Airport for 25 years, with option to lease, paying a rental of \$1 a year to the State.

NEW YORK—The charter airlines have formed the American Flying Club at Manhattan. The club has purchased a Taylor Cub for flying instruction. Charles Wilford is chief instructor.

CHICAGO—New \$100,000 hangar will be constructed at Taylor's newly acquired municipal field, Transcontinental Airport. Taylor's new municipal airport at VANBUREN was dedicated Dec. 15, aviator's 32nd birthday. One day TWA started regular schedules through Dayton.

CLEVELAND—Sale of gasoline and oil at the CLEVELAND CITY Municipal Airport has shown a substantial increase over the budget estimate, according to a report of Manager William Hestley.

ORANGE—E. P. KEO, SEATTLE, has purchased a new Taylor Cub on lease. Portland Air Service, operating at Swan Island (Seaside), has been purchased by the S. & M. Flying Service, owned by Tracy Sims and L. C. Meier.

PENNSYLVANIA—Donald Nelson has opened a charter service at the Phipps Airport, East Stroudsburg, where he will have three planes. He will also maintain a repair shop. Robert C. Halliday and Winifred M. Post, Jr., have leased the ALLEGANY-BETHLEHEM Airport, which they will operate. Both are graduates of Porto Air College.

VERMONT—Stanley Frame, chief pilot, and Webb Kneale will operate Air Service & Sales at CRAWFORDVILLE Airport in the town of Carl Wooten, who has taken a position as pilot manager of Tappanville American Co., Altona.

TEXAS—W. A. Myers is now operating the GRANGE PARKING airport, which is known as the Dallas-Pearl Harbor Air Terminal. Harold Tills is operating the Tills Flying School at the field.

Manager William Miller of the Fox Warner Municipal Airport has reported that 11,600 planes carrying 79,000 passengers used the airport during 1956.

UTAH—Frank J. Palmer has been

named superintendent of construction for the project to enlarge the Salt Lake City Municipal Airport administration building. The Salt Lake Chamber of Commerce is seeking construction of night lighting facilities on the GRAY FALLS HEATER portion of the National Parks Airways route.

VERMONT—Manager Harold W. Pugh has reported that 1956 was the busiest in the history of BURLINGTON Airport. A total of 336 planes registered at the airport, exclusive of the regular daily service of Rutland-Maine-Vermont Airways. Regular pilots at the airport carried 1,261 passengers and made 135 charter trips in the year.

VIRGINIA—The State Corporation Commission has issued a license to the SHELLEY CURTIS Airport, one of the establishments of a number of world speed and altitude records. The RANNEY City Council has voted to take over operation of the RANNEY Municipal Airport, opened since 1950 by Clifton Linn and Frank Berwick.

WASHINGTON—AUSTIN COCHRAN and CLARKSON officials are seeking WPA funds for construction of an airport at Clarkston, to serve both that city and LAWRENCE. The State TWA administration has promised assistance with MARTIN city officials for the establishment of a regular base on Lake Washington.

WEST VIRGINIA—MORGANTHAU is seeking an additional WPA allotment of \$250,000 for completion of an extensive improvement project at the MORGANTHAU Municipal Airport.

WISCONSIN—MADISON officials have voted to accept a \$24,000 WPA loan for construction of runway on a new municipal airport. It is expected that additional funds will be forthcoming later. Total cost of the project is estimated at \$335,000.

Schools

Recently-graduated officials of the Aero Club of Puerto Rico CAGGIO, R. St. Louis (Ill.), are Paul Thayer, president, Victor Thayer, vice-president, J. Paul Dandridge, treasurer, and Charles J. Thayer, sec-

retary. Of the 65 men who were graduated from PARKS in the last three terms, every one was placed in a job before he was actually graduated.

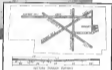
THOMAS A. WOOLLEY has started school in Los Angeles, known as the AERONAUTICAL INSTITUTE or LOS ANGELES, which specializes in the education of mechanical engineers into aeronautical engineers. The school also operates a technical course for instruction of airplane mechanics which qualifies for the short metal work so much in demand at the present time. THE AIRCRAFT WORKS and INSTITUTE TRAINING Co. has been set up at Roosevelt Field, Mineola (N. Y.) to give advanced training in instrument flying. The course includes flight hour instruction on the Link Trainer, and qualifies students for the Bureau of Air Commerce's Non-Scheduled Instrument Rating test. The New York State Education Department has, under the direction of State R. Stewart, set up aviation ground schools in Buffalo, Elmhurst, and Utica. Schools are under the direction of Lewis A. Wilson and Jack Wright. More than 100 students are enrolled.

The School of Adult Education of the General Education Division of the University of Florida, created by the Aviation Division of the State Road Department and the Education Division of the Florida WPA is offering a twelve weeks' unimpaired course at CAVER ROOSTER (Fla.).

FAIRFAX, VA. Schools, one of the oldest flying schools in Fairfax (Va.) and conducted by Lester Meadows, has sold out to State & Moore. The Ocala-Seminole School of Aeronautics, Ocala, Fla. (Ocala) was scheduled to start classes Jan. 12, with Leroy John C. Cook as chief instructor. The RANNEY, LAWRENCE, Schools, located on the Lambert-St. Louis Municipal Airport, St. Louis (Mo.) has announced the opening of night classes in airplane and engine mechanics. Total enrollment is 75, comprising 35 night students, 30 day mechanics students, and 11 night students. Five new instructors, Harold W. Law, Fred W. Brown, Louis Maguire, Ed Wagner and Joe A. Wright, have been added to the teaching staff. Chief Pilot Jay Snowmeyer and Wayne Strout of the Parkbury (Va.) Municipal Airport added twenty-one students during 1956.



Giving a concrete runway the smooth riding surface and sound structure is essential to safe landing. Dayton, Ohio airport. F. O. Eichelberger, city manager; George J. Baker, director of streets and buildings; H. J. Graham, director of WPA.



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Aviation People

Who's who and what they are doing

✧ Five nine years a member of the board of directors and executive committee of Curtiss-Wright Corporation, GEORGE M. ALBERT was recently elected to chairmanship of the board. Curtiss-Wright Corporation is the parent company of Wright Aeronautical Corporation and controls the divisions of the Curtiss Aeroplane Company.

✧ Only change in the board of the recent elections of the Air Transport Association of America is its vice-president, CORT HENRY, manager of Northwest Airlines, succeeding W. A. PARSONS of United Airlines. Re-elected were: C. E. TUCKER, S. GORDON, president; FREDERICK W. BAKER, secretary-treasurer; and M. A. PARSONS, C. H. HENRY, PAUL COLLIER, and JACK REED as directors.

✧ Shide Airlines of Boston will carry on work as before the death of JERRY H. SHIDE since that CHAS. S. COMAN resumed his position as president, general manager, and chief pilot. COMAN comes from Rhode Island State Airport where for the past four years he has acted as general manager and chief pilot. JEROME GARDNER, for some years with E. H. Wiggins Airways, will be treasurer with DAVID DUNHAM and ELMER ELMER continuing as pilots.

✧ On Jan. 3 death claimed EDWARD C. HILLMAN, 50, aviation pioneer. In the early days Mr. Hillman worked with the Wright brothers and with SAMUEL P. LAMONT in designing their first ships.

✧ Sverdrup Aeronautics Company of Farmingdale has placed F. WILLIAM ZACKIN as its newly created office of vice president, his previous having been executive assistant to the president. Mr. ZACKIN was formerly Assistant Commissioner of Docks in charge of Aviation for

the City of New York, in which capacity he managed Floyd Bennett Airport and supervised construction of the seaplane ramps in New York City.

✧ The Vargular Company, in its practice in hydraulic pump division, has placed D. J. GILBERT as charge as chief engineer.

✧ Two members of the staff of American Airlines have moved up to vice-presidents: WILLIAM LUTHERSON, since 1930 chief engineer, becomes vice-president in charge of engineering. Before joining American, Mr. LUTHERSON had been connected with Nash-Buick-Tread Taperoff Road, Ferrell-Cummins Engine Corporation, and Ferrell-Hughes Corporation. Year ago he began on "Upgrading Requirements for Transport Airplanes" now has the S.A.E. Wright Medal. Other promotion is CHARLES A. BURRIS, an vice-president and general sales manager. Mr. BURRIS has been connected with traffic sales since 1928, first with Transcontinental Airlines, later with its successor, American Airlines. His headquarters are in Chicago.

✧ HENRY VAN SLYKE, newly appointed assistant to president JACK PERE of Transcontinental & Western Air, joined the line ten months ago as public relations manager for the central region. Previously he had been transportation editor for the Chicago Journal of Commerce. His office is in Washington, D. C.

✧ DONALD DELANEY, chief engineer of Federal Aircraft Corporation, has resigned to become vice-president of Vandevel Aircraft Corporation. Mr. DELANEY was long associated with the late D. D. CHAMBERLAIN as the design of the record-breaking One Blue series. After the death of Mr. Chamberlain, the firm was reorganized at Graceland, Miller & DeLacour consulting engineers.

✧ New officers of the New York State Aviation Officials are: President, MAX J. FLEURY, American Airlines at Albany, vice-president, W. D. GORDON, Bonanza Field, secretary-treasurer, JACQUES FRYMONTIER. Elections took place at the meeting held in Albany, Dec. 21.



20 When the Army delighted to honor Distinguished Flying Cross to Lieut. Gen. Henry H. Arnold for extraordinary achievement while commanding a flight of ten airplanes from Washington, D. C. to Fairbanks, Alaska and return, from July 19, 1934 to Aug. 30, 1934.

21 Capt. DONALD W. BUCKMAN (Lieutenant), for "bravery while parachuting in an aerial fight from North Field, Cal. to Oakland, Cal., May 12, 1945" during which he effected a safe landing while suffering a severe heart attack, from which he died shortly afterwards.

22 Mr. JAMES H. PORTER, Jr., Son DONALD E. HARTMAN, Capt. FRANK Z. GARNER, for service of seven CCC youths stranded on an ice in the Cape Cod Bay, Feb. 9, 1936.

23 In Lt. EUGENE ALLENBERG, for showing an extraordinary crash his finished plane in the yard where this airport the lines of a thing polished on the beach in 1935.

24 The War Department selected Brig. Gen. HENRY C. PERRY as permanent general officer with recommendations for his appointment as a permanent brigadier general of the line, effective Jan. 1. General Perry is the first Army Air Corps officer to achieve this status. Heberle of the Air Corps has been the only a branch for its officers to have had the length of service necessary for eligibility to the appointment. The General was appointed a Special Lieutenant of Cavalry in 1924, was transferred to the Signal Corps for duty with the Aviation Section in 1917, and on March 13, 1935 assumed command of the 1st Army Wing, GHQ Air Force, Langley Field, where he is now stationed.

25 Being known to readers of the aviation department of the *Boston Evening Transcript*, its editor, GEORGE MAHON, is now turning out publicity and advertising for United Air Lines. MAHON was also formerly publicity man at Boston Municipal Airport. His new job takes him to Chicago.

26 1937 set-up at the National Aeronautics Association: President, CLEMENT F. HARRIS, assistant to the president, May 1931, J. S. TAYLOR, vice-president, THOMAS C. CARSON of Thompson Products Inc., secretary, H. F. KANE of New York City; treasurer, Gen. JAMES H. JONES of Pittsburgh Aircraft Corp.

Detroit vice-president, 1st district GEORGE W. MAHON, Jr., Boston, 2nd district, GAIL RICH WILSON, New Jersey, 3rd district, RALPH W. BOWEN, Richmond, 4th - EUGENE ECKHART V. WATSON, Miami, 5th district, FRED L. SMITH, Columbus, 6th district, Col. J. LAWRENCE WATSON, Chicago, 7th district, Dr. JAMES D. BAKER, Kansas City, 8th district, CHARLES W. SMITH, Jr., Tulsa, 9th district, W. F. BARNES, Los Angeles, C. S. (CARTY) JAMES was elected president-at-large and Omer H. HARRIS was CHARLES WATSON, GEORGE L. CASEY, General HENRY H. ARNOLD, BENJAMIN MACADAM.

27 Air line changes. At TWA's new office in Dayton, C. L. KAMMERER handles east-west service as transportation and passenger agent. Preparatory to inauguration of an Indianapolis-Detroit service, American Airlines has installed RALPH KAMMERER, Jr., at Indianapolis as city sales manager. D. H. BARNETT has been transferred from Jackson to Memphis as district traffic manager for Chicago & Southern Air Lines. RICHARD WATSON succeeds him at Jackson. At Tulsa, R. A. PORTER took over the station membership for Hartford Airlines, having heretofore been based at Omaha. LEROY W. KNOX steps up from assistant district manager for American Air Lines at Chicago to district sales manager, replacing CHARLES A. SMITH who becomes district sales manager at Detroit.

28 Col. CHARLES WATSON ECKHART, chairman of the Aviation Committee of the Advertising Club of New York, was elected commander of Air Service Post 24 at the American Legion, overlooking Haver A. ECKHART Col. ECKHART flew with the Lafayette Escadrille during the World War and is president of the Orleans Section of the Legion Internationally. His brothers, R. & C. ECKHART and MAJOR E. E. ARNOLD were elected vice-commander. Guest of honor at the meeting was Col. WILLIAM A. BARNER, V.C., former R.F.C. line, now Canada's Vice Air Marshal.

29 After some months absent supervising European affairs, LORAIN F. ARNOLD has joined the staff of Pennsylvania-Central Airlines as assistant to its president, C. Bredt Monro. Arnold joined the Bendix

Air Corps in 1917 and in 1924 was one of the group of army fliers to make the first round-the-world flight. Resigning from the Army in 1925, he became affiliated with T.A.T. Modern Airlines, later becoming assistant to the president of Transcontinental & Western Air.

30 Gulf Oil Corporation is proud of its vice-president, D. P. NEWTON, upon whose King Leopold III of Belgium has conferred the decoration "Chevalier de l'Ordre de Leopold". Mr. Newton is foreign representative of Gulf, with offices in Pittsburgh.

31 When in 1937 E. A. HANCOCK joined Wells Fargo as a driver, it is not likely that he foresaw that twenty years later the company would have supplied Old Dollars as a carrier of express. The years have taken him through all the branches of express work. In 1932, he was made superintendent of operations for the Railway Express Agency. In March, 1933, he became superintendent of General Air Express, a division of Transcontinental & Western Air. He has now been promoted to express traffic manager.

32 The career of HENRY M. HANSEN, who died at Los Angeles on Jan. 8, reflects many phases of air transport history during the past decade. From automobile mechanic and the sale of automobiles, Mr. Hansen turned to air transport in 1923, organizing and becoming president of Western Air Express, then carrying mail between Los Angeles and Salt Lake City. The operation expanded, and in 1930 Western Air Express and Transcontinental Air Transport joined to form Transcontinental & Western Airlines, Inc., with Mr. Hansen as president. He expanded after consolidation of the air mail contracts in 1934. Recently he had organized the Western Airplane Company of California. At various times Mr. Hansen had been president at Fokker Aircraft Corp., a director of the Pacific Seaplane Transport Co., and a director of National Aviation Corporation. He had also been vice president for the Northwestern Division of the Aeronautical Chamber of Commerce.

33 From his career career aviation pioneer, MAJOR FRANK LUTHERVILLE of the Royal Canadian Air Force at England is visiting aircraft and engine factories in the U. S., as guest of Wright Aeronautical Corp.



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Square Wave Generators
Capacitive Dividers
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Britain's New Airways

(Continued from page 32)

only from the home government, supplemented by further subsidies from Colonial and Dominion governments, by a substantial share of the post office's income from air mail postage, and by assistance from the Air Ministry in aircraft development costs. With an outstanding capital of approximately 280,000 dollars the company has long aimed at a small profit and not rather good dividends. The Air Ministry share in the original capitalization is represented on the board of directors by two members, and maintains intimate contact with the company.

The present subsidy agreement between the company and the government of the United Kingdom expires in 1936. In the early years of the company it was held directly on village farms. Later it was transferred to a home-grown enterprise arrangement to encourage the acquisition of larger ships. Total direct subsidies received by the company in 1935 were approximately \$1,600,000 of which about 30 per cent represented contributions from the government of South Africa.

"Blenheim Empire air routes" has been a policy which has been the basis for the "Empire Airway." Long campaigns of agitation were required for every forward step. France and the Netherlands, for example, demanded permission to operate over France and the Netherlands East Indies only in exchange for reciprocal privileges across British territory. Persia has now given permission for British operations over its territory. Italy has refused our demands after another opportunity, too, Imperial has had their going over in demand and other inter-national airways of the Empire staff. Frequently it has been necessary to organize a sub-empire in each direction concerned.

COMPETITION from the airlines of other nations has also raised serious problems for Imperial. France and the Netherlands, motivated by the same desire to keep their political empire more closely unified, would Britain step by step in extending air routes to southern Asia.

Finally (1935), the North Atlantic came to weigh heavily on the minds of Imperial officials. As early as 1930 Pan American Airways had

started actual progress toward a trans-Atlantic service by establishing a route from Boston to the Maritime Provinces. Too hesitated elsewhere to make such service at the time, Imperial secured a post-ponement of further Pan American agreement by negotiating an agreement to the effect that Pan American and Imperial would mutually share on an equal footing any trans-Atlantic operations undertaken by either. The development in America, of the Sikorsky and Martin Clippers, therefore, put England in the position of being solely responsible for trans-Atlantic flights. Then last year Germany joined the game with its Zepplins and transport planes.

All added, Imperial Airways found itself, in 1935, with a network of lines fifty thousand miles long and along a 20,000 mile service its routes to India and Africa were vulnerable in every sense of a half dozen countries with policies affecting back and forth in response to the requests of European powers. It was among no other in the North Atlantic, it might well have undertaken a half dozen extended projects of land-based service, thereby improving its situation temporarily. Instead, it is facing the world with its present really adequate program for expansion.

ITS EQUIPMENT PLANS are more important. Altogether there are some 40 new planes already ordered, or expected during 1937. Of these, 38 are 16-passenger flying boats from the Short Brothers factory in Rochester. Powered with four Napier engines of 740 hp each, they will have accommodation for 24 passengers on dry docks, 16 on single journeys. They will have a crew of five, and capacity for big mail cargoes, at least on flights up to 3000 miles. Their top speeds have been announced as 190 mph per hour.

Twelve of the ships are ordered will be four-engine Armstrong-Whitworth "Kestrel" land planes equipped for 27 day passengers and 20 at night. The total horsepower of the four Turboprop engines is 3200. Their top speeds are to be "about" over 250 miles per hour. Also under construction is the old Short Works composite. The latter

consists of two flying boats designed to take off when forward together into a single unit. Once in the air (at a suitable altitude), the two ships separate the heavily loaded top component proceeding to its destination and with its cargo, the larger "take-off" remaining in its base of operations.

(Continued on page 31)

Air Bumps

(Continued from page 31)

Though the regulatory authorities presumably will act to attempt to act on the matter, the suggestion is, plus that existing rules are far too severe for makers of light landing. It is calculated ability to support a gust of 50 ft. per sec. true velocity is taken as having been demonstrated by experience to be quite sufficient in velocity in comparison with the blades (reversing mechanism and hydraulic) transport planes and bombers should continue to be designed for an effective gust of 50 ft. per sec. in the past. For the typical private owner cabin plane, however, 25 ft. per sec. would seem sufficient, and for a cruise light plane, only a 15-ft. effective gust as those would require load factors already met, as compared with those needed for even the general maneuvering, the reduction in plane load for accidents with a wing loading of less than about 12 lb. per sq. ft. the gust-loading factor of specifying load factor is a misleading one. For airplanes of that class even if not designed especially for accurate performance maneuvering loads should be imposed to regulatory requirements.

Before the full meaning can be drawn from these studies with respect to very large airplanes, more must be known of the probable dimensions of the full-velocity gust at a point. It seems quite probable that the strength begins to diminish as the gust is traversed, very soon after the maximum is reached; that the transverse velocity curve has in fact the form of a wave, that a large airplane may therefore be expected always to escape having its full span subjected to the gust's fullest intensity at the same instant, and that the loads on the wings of such a machine may be inferentially reduced thereby. There is the sort of fact for research

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Britain's New Airways

(Continued from page 67)

Several of the Short Empire boats have already been delivered and have been extensively flown. Another arrived early in January at Bermuda, mostly sent on the deck of a steamer and is in progress of assembly. Two more are being fitted at England for an early assignment of a service between that island and New York. Two more are being fitted at England with large extra tanks to enable them to take part in pioneering trans-Atlantic flights early this summer, and of course the Mayo boats may likewise appear over the Atlantic during the coming season.

BUT the Atlantic is by no means the sole or even the principal objective of Imperial's building. There is already a mile of its present system for which plans have not been made to offset the new sea-ouglid ships. The Mediterranean is, of course, an ideal sphere for action. Immediately they demonstrate actively England's political dependence. If arrangements with Italy are not entirely satisfactory, the big planes can proceed directly across France from England to Marseilles, thence to Genoa and Egypt by way of Malta, a British possession. If France, too, shows difficulties, a preferred route could be laid out from England down the Atlantic coast of Africa, then across just north of the equator to the Indian Ocean, with permission necessary only from Belgium or Portugal. So such reversionary of sources may ever be necessary. But their possibility adds immeasurably to the strength of the British position.

Beyond Cairo the Empire boats are to be no less important. By April 3 enough are expected to be available to get the entire route to South Africa on a flying boat basis. Up the Nile, via the White Nile and one of its tributaries, the ships will make their way to Lake Victoria. From there, instead of following the present route which lies some 200 miles to the east, coast, they will turn southward and fly along the edge of the Indian Ocean to Durban on South Africa. Meanwhile it is planned to have the African Airways run local services over the present land route south of Lake Victoria. The Cairo-Australia service is likewise to be put on a flying boat basis, taken and every being sailed for stage east, England and across India. On the Singapore-Durban stage they are shown improvements over the last planes now in use. In the latter, too, they are slated to start operations between Australia and New Zealand.

TO MEET the heavy cost of all this equipment, Imperial, with the approval of the Air Ministry, is increasing its capitalization to approximately \$100,000,000. Before undertaking the building program it is understood to have reached a close general agreement with the government on the terms of a new 15 year extension of its subsidy contract. The basic direct subsidy is cut, however, to increase materially. What is to change the lesser side of Imperial Airways' ledger are payments for services rendered to His Majesty's Post Office. Which brings us to the Empire Air Mail Plan.

For many years, air mail boats, even on the long empire routes, have been light by American standards. Then successive reductions in postal subsidies sent them swiftly spiraling. Last year, doubling of frequencies over most of the system and a postal rate of 6 pence (12 cents) per half ounce to Cape Town or as far as necessary, took to the point of seriously hindering passenger capacity on trunk routes. Now it has been announced that starting April 1, all mail from the United Kingdom will be carried to South Africa via the new Empire service on the regular uncharged postage of three cents per half ounce.

Just when arrangements Imperial has concluded with the post office as to its share of such a profit has not yet been made public, but it is assumed to be substantial. What boats will be like once the new rate is extended to the entire empire has been forecast by Mr. Denis Henderson, Imperial's traffic manager. "Actually something like 30 tons of mail will leave London each week by air on the equivalent of nearly 2,000,000 letters from that country alone. Normal airplanes will call for twice-weekly service between London and Sydney, three planes from London to Singapore, four from London to Calcutta, one from London to Rangoon, London-Kuala Lumpur, and London-Durban, two with provisions for connections to China and West Africa. Current postage will necessitate the use of about 40 large aircraft, day and night, backward and forward, for short haul routes. . . . The Empire is not only to bring the end-product of division of space an aircraft between mails, passengers, and freight. Moreover now, passengers generally accept mail and freight, in the future, mail will outweigh passengers and freight."

The Undersecretary of State for Air, in describing the plan to the House of Commons, said the ultimate aim was to achieve a two and a half day schedule to India and West Africa, a four and a half day schedule to South Africa and to Singapore, and a six-day day schedule to Australia. Such a schedule, of course, even with the new cruising speeds, will require a wide development of night flying. This is by no means the least revolutionary part of the whole program.

WHAT an astonishingly bold project this is! Then, of course, that is the end of a frantic attempt to make up lost ground in the European race for European military supremacy. The British government has had to make a decision on the duration of manufacturing facilities for the construction of no great commercial fleet. Incidentally, they are likewise providing Imperial's plans to double its flying staff in spite of the severe shortage of pilots for the Air Force. (In a way, of course, the six-man plan has much to justify it as a deliberate measure, for it is conceivable that such a process of space destruction could fail to have

(Turn to page 33)

What ship
do you fly
?



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Seaplane Handling

(Continued from page 25)

no help available. If the boat is being used regularly, old men should be kept along the sides to protect the passengers. Fig. 3 shows an approach in the same direction with the wind in a different direction. Fig. 4 gives a third condition, once controlled by the wind at right angles with a wind velocity estimated at 25 to 40 mph., much too high to risk turning. In this last case stop the one day of the ship way on the left side, the passengers lead to get off over the bow. This, however, could be contained more or less of an emergency, as with one person (the right) and one in each row, bumping onto a line from the bow of the ship, to hold it in to the float. The cautious approach was the only one possible.

The wind approach to a float is that in which the ship can be towed approximately into the wind but along one side of the float. An S-shaped float, without much obstructions, renders this procedure possible in those out of the four general wind directions. In the case of a ship equipped with winged piers, however, it is almost essential that there be an obstacle on the float to hit the way as the ship comes alongside as otherwise the top position will be damaged.

In approaching any float or dock where there is a strong current, such as is found in tidal river mouth, the current must be taken into consideration. In such cases, the ship will swing back into the wind but

unless the wind velocity is fairly high, the travel will be with the current instead of with the wind. It is extremely disconcerting to a pilot who has never met into this situation to find himself, as he thinks all set to sail back before the wind but instead leaving down at a good rate of speed onto a flock of geese or other obstruction. There isn't much he can do about it either unless he has room enough to start the motor and turn, which is seldom the case. To decrease which way the ship is likely to move after it is on the water, note the boats which are at anchor. The airplane will probably move toward the stern of the boat, regardless of what direction the wind blows. If no boats are in sight or if there are any one boat and determine in which direction they blow. Unless the wind is very strong, the ship will move in that direction. If there are neither boats nor buoys, careful guess should be left to determine the direction of the current before getting into a restricted space.

This approach is a dock or pier, assuming that it is higher than the wing, must be done first and the passengers will have to get on or over from the bow. If the wind is not directly at ninety degrees to the side on which the approach is made, a line from the windward float should be passed to someone on the pier and pulled up tight. Otherwise the ship will swing and the forward wing will strike against the pier.

The wind approach to a beach is when the wind is onshore, and the beach is easily with a strong slope. The ship may be towed fairly close, the motor cut and the water released. The plane will then swing into the wind and sail back onto the beach. The pilot may then go out of the stern, hit the tail and drag the ship back, which will leave the rear end of the float high and dry. If the wind is offshore, it will be necessary to taxi right onto the beach, and the pilot will have to get out over the nose with a line fastened to the mooring chain before the ship drifts back. If the ship is an amphibian and the beach is firm, the procedure, of course, is to get the wheels down and taxi completely out of the water. Unless the pilot is sure of the character of the shore, however, this measure should not be attempted, as getting stuck in the mud, half on and half out of the water, is an embarrassing predicament, particularly if the tide is running out. If there is any doubt about the safety of the bottom, the wheels should be left up and the approach made on wheels. In no case, this case not to be caught by the tide. If this should certainly be allowed to happen, there are only two things to do: wait for the tide to come in, or slide the ship into the water on planks laid crosswise and thoroughly wetted. Somebody will have to get the last one.

In leaving a beach, float, or pier, someone again comes into play. If the wind is onshore, or toward the side of the float or pier at which the plane is lying, and all is clear in front, otherwise the only thing necessary is to give her the gun. However, as it probably more often the case, if the wind is blowing from the point to which the ship is towed, the lines should be cast off and the plane allowed to sail back away from the landing point until there is ample room to move and taxi out at which time the motor may be started.

ONE OTHER POINT should be mentioned and that is the matter of transferring passengers to or from boats. In calm water the best should be brought up from the rear, but in rough water a large sea would be brought across the bow of the passenger and a line passed from the bow of the motor boat around the mooring chain on both piers and then in the stern of the boat where it is pulled tight.

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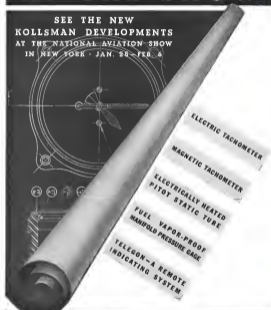
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Above: Eclipse Combustion Starter operating from power developed by remotely controlled igniting of concentrated energy in cartridge form.



Above: Eclipse Type E-160 Direct Cranking Electric Starter with integral hand cranking gear, for 12 or 24 volt operation and providing push button remote engine starting control.



THROUGH twenty years' experience in the design, development and manufacture of aircraft engine starting equipment, ECLIPSE AVIATION CORPORATION has anticipated and pioneered in fulfilling the starter requirements of engine manufacture throughout the world for commercial, military and private applications.

Many varied installation, operation and service conditions have been fully recognized, and proper starting equipment has been made available to meet such needs. With this well founded knowledge, ECLIPSE AVIATION CORPORATION offers the following basic type starters, operating from various power sources, to serve specific purposes.

POWER SOURCE	STARTER-TYPE
Manual	(a) Inertia (Manual only) (b) Hand Turning Gear
Electricity (DC-12 or 24 volt)	(a) Inertia (Combination Manual and Electric) (b) Direct Cranking Electric
Air Pressure	(a) Air Injection
Cartridge (Powder)	(a) Combustion
Electricity (AC-110 volt-800 cycle)	(a) Inertia (Combination Manual and Electric) (b) Direct Cranking Electric

ECLIPSE AVIATION CORPORATION
EAST ORANGE, N. J.
(Subsidiary of Bendix Aviation Corporation)

Visit the Eclipse Exhibit at the
NATIONAL AIR SHOW
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